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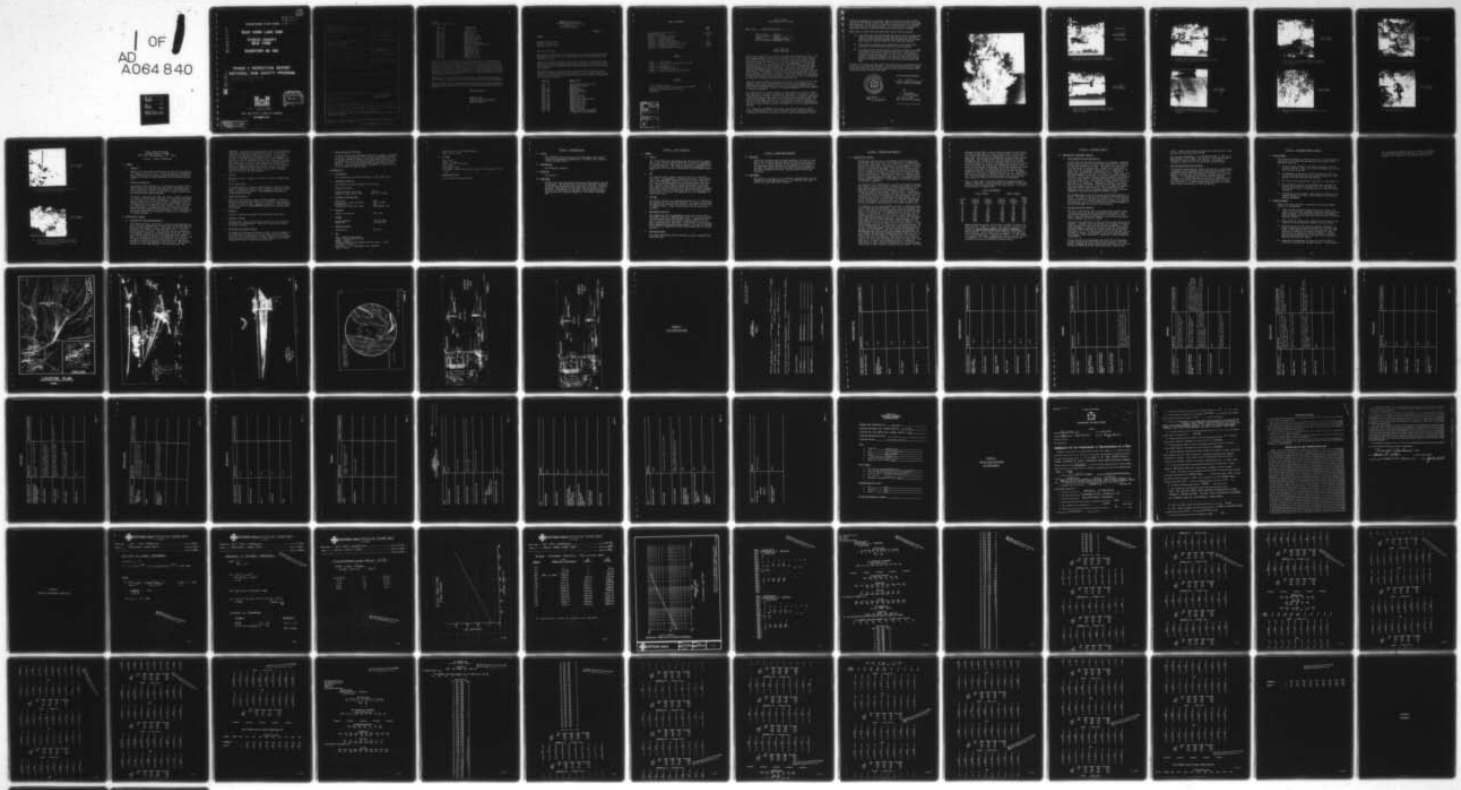

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SUSQUEHANNA RIVER BASIN

BUCK HORN LAKE DAM

OTSEGO COUNTY
NEW YORK

INVENTORY № 362

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Buck Horn Lake Dam (362). Susquehanna River Basin, Otsego County, New York. Phase I Inspection Report.

John B. Stetson

DACW51-78-C-0035

NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1978

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Buck Horn Lake Dam
Otsego County

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical cordition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Buck Horn Lake Dam was judged to be unsafe-non-emergency due to a seriously inadequate spillway.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

NANEN-P
Honorable Hugh L. Carey

I.D. NO.	NAME OF DAM
N.Y. 49	Pocantico Dam
N.Y. 445	Attica Dam
N.Y. 658	Cork Center Dam
N.Y. 153	Jackson Creek Dam
N.Y. 172	Lake Algonquin Dam
N.Y. 318	Sixth Lake Dam
N.Y. 13	Butlet Storage Dam
N.Y. 90	Putnam Lake (Bog Brook Dam)
N.Y. 166	Pecks Lake Dam
N.Y. 674	Bradford Dam
N.Y. 75	Sturgeon Pool Dam
N.Y. 414	Skaneateles Dam
N.Y. 155	Indian Lake Dam
N.Y. 472	Newton Falls Dam
N.Y. 362	Buckhorn Lake Dam

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

Consequently, it is advisable to implement the recommendations previously furnished in the reports for the above-mentioned dams as soon as practicable.

It is requested that owners of these dams be furnished a copy of this letter and that copies be permanently appended to all reports previously furnished to you.

Sincerely yours,

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, NEW YORK
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

2 OCT 1 3

NANEN-F

Honorable Hugh L. Carey
Governor of New York
Albany, New York 12224

Dear Governor Carey:

The purpose of this letter is to inform you of a clarification of the guidelines used by this office in assessing dams under the National Program of Inspection of Dams.

Office of the Chief of Engineers has recently provided a clarification that dams with seriously inadequate spillways are to be assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The following dams in your state have previously been assessed as having seriously inadequate spillways, with capability to pass safely only the percentage of the probable maximum flood as noted in each report. They are now to be assessed as unsafe:

I.D. NO.	NAME OF DAM
N.Y. 59	Lower Warwick Reservoir Dam
N.Y. 4	Salisbury Mills Dam
N.Y. 45	Amawalk Dam
N.Y. 418	Jamesville Dam
N.Y. 685	Colliersville Dam
N.Y. 6	Delta Dam
N.Y. 421	Oneida City Dam
N.Y. 39	Croton Falls Dam
N.Y. 509	Chadwick Dam (Plattenkill)
N.Y. 66	Boyds Corner Dam
N.Y. 397	Cranberry Lake Dam
N.Y. 708	Seneca Falls Dam
N.Y. 332	Lake Sebago Dam
N.Y. 338	Indian Brook Dam
N.Y. 33	Lower(S) Wiccopee Dam (Lower Hudson W.S. for Peekskill)

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam Buck Horn Lake NY362

State Located New York
County Located Otsego
Stream Buck Horn Lake
Date of Inspection September 6, 1978

ASSESSMENT OF GENERAL CONDITIONS

The Buck Horn Lake Dam is an earthfill dam with a wood sheeting core wall. The dam is approximately 280 feet long and approximatley 15 feet high. Top width of the dam is 10 feet. The principal spillway is located just south of the center of the dam and consists of a 30 foot wide ogee type concrete spillway. Spillway elevation is 3 feet below the top of the embankment. The dam drainline consists of a 24 inch corrugated metal pipe with a submerged slide gate controlling flow to the inlet of the pipe. Mead Creek, the receiving stream from the impoundment crosses the Delaware and Hudson Railroad and New York State Route 7, approximately 1/2 mile from the dam, placing the dam in the High Hazard Category. The dam has a storage volume of approximately 560 acre feet placing the dam in the Small Size Category. Buck Horn Lake Dam was constructed in 1949 by the Buck Horn Lake Development Corporation for use as a recreational facility for residential properties surrounding the lake.

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 30 percent of the Probable Maximum Flood (PMF). The spillway is therefore adjudged as seriously inadequate and the dam assessed as unsafe non-emergency.

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

It is, therefore, recommended that within 2 months from the date of notification to the Governor of the State of New York, owners engage the services of a professional consultant to determine by more sophisticated methods and pro-

cedures the adequacy of the spillway. Within 12 months of the date of notification to the governor, appropriate remedial mitigating measures should have been completed. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

Other areas of concern have been noted which should receive attention:

1) Trees and brush should be removed from the dam surface and the areas should be seeded and mowed so that they may easily be inspected. Trees and stumps should be removed from the abutments and the stump holes should be properly backfilled with impervious material.

2) Riprap should be placed on the upstream face of the dam at the waterline to provide adequate protection from wave action.

3) The drainline from the dam should be inspected throughout its length to determine the amount of deterioration that has taken place in areas that are not visible from the outlet end. The drainline, if severely deteriorated throughout its length, should either be replaced or relined and grouted. The shear gate controlling the dam outlet pipe should be accessible for operation from the water surface.

The work on all areas requiring remedial measures should be performed under the direction of a Professional Engineer. While these problem areas do not appear to be significant under normal flow conditions, they could be sources of dam instability during a severe flood event.

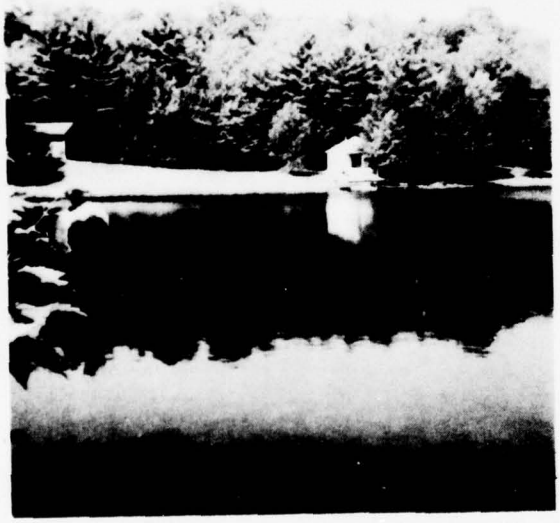
Dale Engineering Company

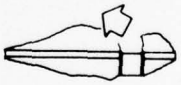
John B. Stetson, President

Approved By:
Date: 29 September 78

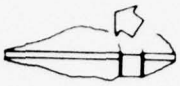
Col. Clark H. Benn
New York District Engineer

1. View looking west across face of dam. Spillway is in left portion of picture.

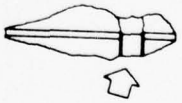




2. View looking west shows typical overbank area and structures close to the water's edge.



3. Another view looking west showing lawns and docks in the area.



4. Closeup of spillway surface which is in serviceable condition with some surface erosion.

5. View of spillway apron which is also in serviceable condition. Notice drains in channel wall.

6. Typical picture showing treed area on top of dam.

7. View of downstream spillway channel.

8. Outlet pipe area.

indicator that the spillway is inadequate.

9. Closeup of corrugated outlet pipe with its rusted-out invert section.

10. View of heavily treed area along the eastern portion of embankment looking across the spillway.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM - BUCK HORN LAKE ID# - NY362

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Dale Engineering Company and The New York State Department of Environmental Conservation.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Buck Horn Lake Dam and appurtenant structures, owned by the Buck Horn Lake Corporation, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the State of New York.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Buckhorn Lake Dam is an earth-fill dam with a wood sheeting core wall. The dam is approximately 280 feet long; the maximum height of the dam is approximately 15 feet. Downstream slopes on the dam are 2 horizontal to 1 vertical; the upstream slope is 3 to 1. The top width of the dam is 10 feet. Plans indicate that the upstream face of the dam was riprapped at the waterline and at the toe. The plans also indicate riprap at the toe of the downstream slope, however, there is no evidence of riprap at the downstream toe in the field and the riprap at the waterline is in poor condition. The principal spillway is located to the south of the center of the dam and consists of a 30 foot wide ogee type concrete spillway. The spillway is situated at a level approximately 3 feet below the top of the

embankment. Pipe supports in the spillway allow for the placement of flashboards although no flashboards were in place at the time of the inspection nor were they on the site of the dam. The principal spillway is constructed of rubble masonry with a concrete surface. The plans of the dam indicate a drain line of 30 inch diameter. Inspection at the site indicated the drain line to be a 24 inch corrugated metal pipe. The drain is controlled by a submerged slide gate that can be operated only by divers. Mead Creek, the receiving stream, is founded in glacial till and shows little sign of erosion. The channel immediately downstream from the spillway is heavily overgrown with brush and small trees. Loose rock fill has been placed at the toe of the spillway apron.

b. Location

Buckhorn Lake Dam is located in the Town of Unadilla, Otsego County, New York.

c. Size Classification

The maximum height of the dam is approximately 15 feet; the storage volume is approximately 560 acre feet. Therefore, the dam is in the Small Size Category as defined in The Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

Mead Creek, the receiving stream from the impoundment, crosses the Delaware & Hudson Railroad and New York State Route 7 approximately one-half mile from the dam. Therefore, the dam is in the High Hazard Category as defined by The Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the Buckhorn Lake Development Corporation.

f. Purpose of the Dam

Buckhorn Lake is used for recreational purposes by the residents of the Buckhorn Lake Development. There are no provisions for public use of this facility.

g. Design and Construction History

The Buckhorn Lake Dam was constructed in 1949. Since the completion of construction, the west wall of the spillway structure has been replaced. The original west wall of the spillway structure collapsed due to excessive soil pressures. No other information is available regarding the design or construction of the dam.

h. Normal Operational Procedures

The dam is owned by the Development Corporation composed of residents of the area. Maintenance of the structure is provided by volunteer work groups composed of members of the Development Corporation. Major maintenance is provided through contract with local construction companies. There are no standard operational procedures for this facility. Water discharged from the impoundment is controlled only by the limitations of the spillway.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Buck Horn Lake Dam is 1.882 square miles.

b. Discharge at Dam Site

No discharge records are available for this site.

Computed Discharges:

Ungated spillway, top of dam	500 cfs
Ungated spillway, design flood	1003 cfs (1/2 PMF)

c. Elevation (feet above MSL)

Top of dam	1183
Maximum pool - design discharge	1184 (1/2 PMF)
Spillway crest	1180
Stream bed at centerline of dam	Approximately 1167

d. Reservoir

Length of normal pool	2800 feet

e. Storage

Design surcharge	340 acre feet
Normal pool	560 acre feet

f. Reservoir Surface

Spillway pool	83.6 acre

g. Dam

Type - Earth fill and masonry
Length - Approximately 280 feet.
Height - 15 feet.
Freeboard between normal reservoir and top of dam - 3 feet.
Top width - 10 feet.
Side Slopes - 2 on 1 downstream; 3 on 1 upstream.
Zoning - None.

Impervious Core - 4 inch wood sheeting.
Grout Curtain - None.

h. Spillway

Type - Weir
Length - 30 feet.
Crest Elevation - 1180 (MSL).
Gates - None.
U/S channel - None.
D/S channel - Short concrete apron, natural stream channel on flat rocks.

i. Regulating Outlets

24 inch diameter corrugated steel.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The information available for review of the Buckhorn Dam includes plans for construction of Buckhorn Lake, included in this report as Figure 2 through Figure 6.

2.2 CONSTRUCTION

No information available.

2.3 OPERATION

See Section 4.

2.4 EVALUATION

Review of the plans indicate that the design of the Buckhorn Lake Dam was adequate. The dam has been in place since 1949 with no evidence of any incident which would affect the safety of the dam. Therefore, additional investigation into the design and construction of this facility is not necessary at this time. Visual examination and the data reviewed were considered adequate for this Phase I investigation.

SECTION 3 - VISUAL INSPECTION

3.1 SUMMARY

a. General

The field inspection of the Buckhorn Lake Dam took place on September 6, 1978. The dam presently functions to provide an impoundment for recreational use. Water level at the time of the inspection was at spillway elevation. The inspection team was accompanied on the inspection by the President of the Buckhorn Lake Development Corporation.

b. Dam

The dam and spillway visually conform to the plans as provided in this report. The embankment is overgrown with trees, brush and tall grass. The embankment is generally in good condition. Wet areas were found at the downstream toe of the dam just north of the spillway. No evidence was found to indicate flowing water in the wet areas, however, typical wetland grasses were found in these areas. The riprap on the upstream face of the dam was obscured by the heavy growth of the brush. No evidence was found in the field to confirm the existence of riprap at the downstream toe of the embankment as shown on the plans.

c. Spillway

The concrete spillway is in generally good condition. At the time of the inspection the spillway was covered with dry algae; a small flow was observed over the top of the spillway. The face of the spillway is somewhat eroded. A small crack exists across the face of the spillway.

d. Appurtenant Structures

The drawdown pipe for the impoundment consists of a 24 inch corrugated metal pipe with a submerged shear gate. No provisions are made for operating this gate from the water surface. Operation of the gate is possible only by diving down in approximately 12 feet of water to manipulate the shear gate. Discharge end of the corrugated metal drawdown pipe was severly deteriorated. The invert of the pipe at the outlet was completely rusted through exposing the soil around the pipe.

e. Downstream Channel

The channel immediately below the spillway is heavily overgrown with trees and brush.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures have not been documented or written up by the owner. The inspection team was unable to witness any operation of this facility. Normal operation of the dam consists of outflow from the impoundment being controlled by the geometry of the principal spillway. The dam was reputed to have been inspected two years ago when the impoundment was drained. The dam had been drained once previously.

4.2 MAINTENANCE

Maintenance for the facility is provided by volunteer groups from the Buckhorn Lake Development Corporation. The embankment and slopes of the dam are poorly maintained at present.

SECTION 5 - HYDROLOGY AND HYDRAULICS

5.1 EVALUATION OF FEATURES

The Buck Horn Lake Dam lies at the southern end of Buck Horn Lake. The drainage area of the lake is 1.88 square miles as planimetered from U.S.G.S. quad sheets, the lake is 0.53 miles long with a surface area of 0.13 square miles. The volume of the impoundment is purely a function of the natural watershed. For the dam's location, no historical information was available on the occurrence of flood events. Also, no information relevant to the design of the dam was available for this investigation. Therefore, this analysis is based on information obtained from the field inspection, the plans included herein, U.S.G.S. quadrangle mapping and other sources of information and references listed in Appendix E. The hydrologic and hydraulic analysis is provided in Appendix C.

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. This has been assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the reservoir and the dam's spillway system. The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration runoff of a specific location that is considered reasonably possible for a particular drainage area. Since this dam is in the Small Dam Category and is a High Hazard, the guidelines criteria (Ref. 1) require that the dam be capable of passing one-half the Probable Maximum Flood.

The hydrologic analysis was performed using the unit hydrograph method to develop the flood hydrograph. Due to the limited scope of this Phase I investigation, certain assumptions, based on experience were used in this analysis and in the determination of the dam's spillway capacity to pass the PMF. This was done with the concept, that if the dam was unable to satisfy this criteria, further refined hydrologic investigations would be required. In preparing the unit hydrograph, both Clark and Snyder coefficients were estimated. For the Clark Method, values of Tc = 0.95 and R = 0.95 were computed. The values of R/(Tc + R) was estimated at 0.50 for the analysis. For the Snyder Method, values of Tp = 3.60 and Cp = 0.625 were computed. The two unit hydrographs were developed from these parameters as well as two sets of PMF hydrographs. The resulting two PMF hydrographs developed from the two methods were then compared and evaluated. The PMF hydrograph was determined using the Probable Maximum Precipitation rainfall data obtained in Hydrometeorological Report No. 33. An index rainfall of 20.5 inches for 200 square miles for a period of 24 hours was used in the analysis. Base flow for the basin was assumed to be 2 cubic feet per second per square mile, while loss rates were set at 1.0 inches initial abstraction and 0.1 inches/hour continuous loss rate. The loss rate functions for the basin yielded 17.62 inches of runoff from 21.31 inches of precipitation. The flood

surcharge storage effect from the lake was assumed to vary linearily with the spillway elevation surface area (the lake's spillway elevation surface area times the surcharge depth yeilds storage - See Sheet C-4). Only the service spillway was evaluated to pass the PMF hydrograph. The draindown conduit gate was assumed to be closed. Although the dam is maintained by the lake community and the Buck Horn Lake Corporation, no one is assigned to keep watch on the dam on a full-time basis. In addition, the drawdown outlet gated is the center of the lake and is submerged. The spillway capacity (up to the top of the dam elevation) considering the service spillway only is estimated at 500 cfs. This was based on an effectively spillway length of 30 feet with a discharge coefficient of 3.2. The earthen dam section was assumed at elevation 1183 for the total length of the dam. The elevation of the lake was assumed to be at the spillway crest (elevation 1180) at the initiation of the flood event.

The U. S. Army Corps of Engineers, Hydrologic Engineering Center's Computer Program HEC-1 using the Modified Puls Method for flood routing was used to evaluate the dam and spillway capacity. The results of this analysis are shown below:

HEC-1 PMF ANALYSIS

	CLARK'S METHOD		SNYDER'S METHOD		
Percent Of PMF	Run-off Discharge (CFS)	Routed Discharge (CFS)	Run-off Discharge (CFS)	Routed Discharge (CFS)	Routed Flood Stage (FT)
10	488	176	274	134	1181
20	976	457	547	263	1182
30	1464	324	821	537	1183
40	1951	1221	1094	768	1183
50	2439	1821	1368	1003	1184
60	2927	2285	1641	1331	1184
70	3415	2744	1915	1632	1184
80	3903	3160	2188	1908	1185
100	4878	4098	2735	2499	1185

Based on the above results, the spillway is capable of passing only 30% of the PMF. Since this value is less than 50%, according to the guidelines, the spillway is deemed to be severely inadequate. This analysis indicates the dam would be overtopped by approximately 2 feet by the PMF. A more indepth study in regards to the evaluation of the spillway capacity is therefore recommended. If futher analysis confirms these Phase I investigation results, that the spillway is inadequate, it is then recommended that the owner modify the structure to provide for additional spillway capacity.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations And Data Review

The Buck Horn Lake Dam shows no evidence of misalignment, sloughing, surface cracks or erosion of significance which would be indicative of structural movement or distress. The condition of the riprap on the upstream face is rated as poor. Vegetation, including small trees and shrubs are growing along the top of the embankment in the upper slope. The embankment's downstream face is covered with grasses and vegetation and trees of various sizes. Large trees exist near both abutments of the dam. The spillway is ungated concrete structure. The spillway structural concrete components are generally in fair to good condition, although some erosion has occurred and some small cracks exist. The spillway discharge channel floor is in heavy glacial till material. Vegetation is growing in the channel floor and on the earth banks. Although some wet spots were found near the spillway at the toe of the slope, no evidence of seepage or piping was found at these locations. Close examination of the downstream slope of the dam, although somewhat obstructed by heavy undergrowth, indicated no evidence of erosion or piping.

The corrugated metal pipe drainline was severely deteriorated at its outlet. The invert of the pipe was completely rusted away exposing the soil to erosion at the end of the outlet pipe. It is a distinct possibility that this condition could occur throughout the length of the drainpipe. Failure of the drainpipe could cause displacement of the earth embankment and failure of the structure.

b. Geology and Seismic Stability

The area is underlain by rocks of the Upper Devonian Oneonta Formation according to the New York State Geologic Map (1970). These rocks consist generally of reddish shales, siltstones, and sandstones. Beds are relatively horizontal, rarely having a dip greater than 1-2 degrees, and are well jointed.

According to the application of 1947, the dam and banks would rest on "hardpan." "Hardpan" varies considerable as to meaning in different areas and among individuals and thus has been recommended as being almost meaningless. The site is on glacial material, and according to Coates (1963), these materials may be largely glacial out-wash above glacial till. The precise composition of the "hardpan" and its thickness is unknown. Also unknown is the precise material beneath the "hardpan." Such information is required for proper permeability interpretation.

Neither the New York State Geologic Map (1970) nor the Preliminary Brittle Structures Map (1977) show any faults present in the area. Several lineaments of unknown origin, none closer than 2-1/2 miles to the dam are indicated on the Preliminary Brittle Structures Map

(1977). Coates (1963) states that some small faults do occur in the area but are local and of small extent.

Only two minor earthquakes, II on the Modified Mercalli Scale, have been recorded in this region. One occurred in 1935 and the other in 1964 and no closer than 35 miles to the dam. This region is designated as being in Zone 1 of the Seismic Probability Map.

c. Data Review and Stability Evaluation

The available design drawings indicate that the dam is constructed of a homogeneous earth embankment with a wood sheeting core wall. The embankment does not show any evidence of instability at this time. However, the condition of the drainline corrugated metal pipe is of concern. It is recommended that the drainline be inspected throughout its length to determine the amount of deterioration that has taken place in the areas that are not visible from the outlet end. The drainline, if severely deteriorated throughout its length, should either be replaced or relined and grouted.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

The following assessments are based on the Phase I visual examination and analysis of the hydrology and hydraulics and analysis of the structural stability:

1) The dam visually conforms to the details provided in the construction drawings. There are no signs of deformation or structural distress to the dam.

2) The embankment of the dam is heavily overgrown with trees and brush on the downstream slopes and along the waterline. Large diameter trees are found near each abutment.

3) The riprap on the upstream face of the dam is in poor condition.

4) The drainline to the dam is a corrugated metal pipe which is severely deteriorated at the outlet end. The shear gate controlling the drainline is submerged so that it must be operated underwater.

5) The capacity of the spillway is approximately 30 percent of the Probable Maximum Flood (PMF). This classifies the spillway as severely inadequate.

7.2 REMEDIAL MEASURES

Based on the above assessments of the dam, the following remedial measures are recommended:

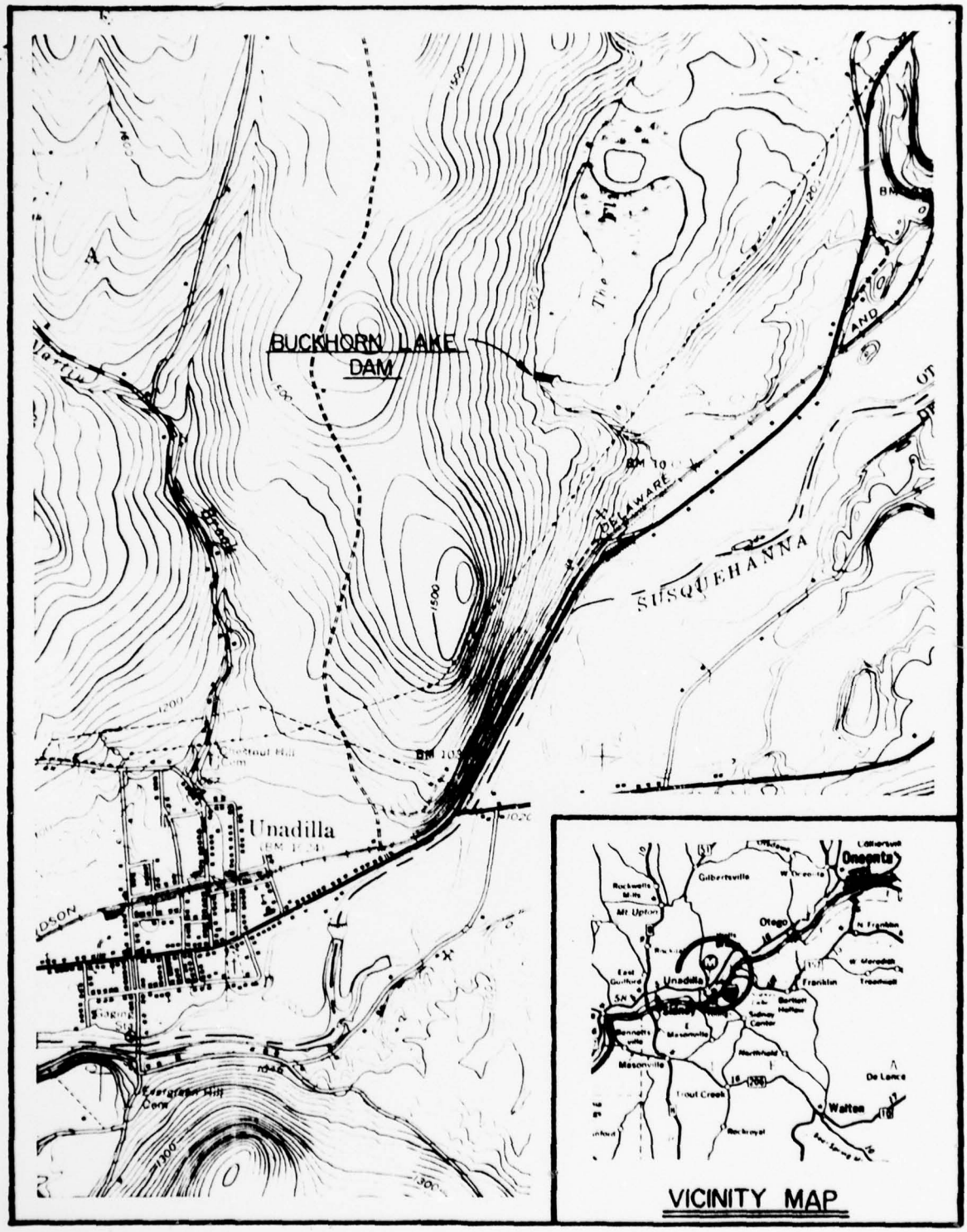
1) Trees and brush should be removed from the dam surface. The slopes of the dam should be seeded and mowed so that they may be easily inspected. Large trees and stumps near the abutments should be removed and the stump holes should be back filled with impervious material.

2) Riprap should be placed on the upstream face of the dam at the waterline to provide adequate protection from wave action.

3) The drainline for the dam should be inspected throughout its length to determine the amount of deterioration that has taken place in areas that are not visible from the outlet end. The drainline, if severely deteriorated throughout its length, should either be replaced or relined and grouted. The shear gate controlling the dam outlet pipe should be accessible for operation from the water surface.

4) A more detailed hydrologic and hydraulic analysis should be performed to determine the spillway capacity. If the results of

this investigation indicates that the spillway is inadequate, the owner should modify the spillway to provide additional capacity up to 50 percent of the Probable Maximum Flood.



LOCATION PLAN

FIGURE 1

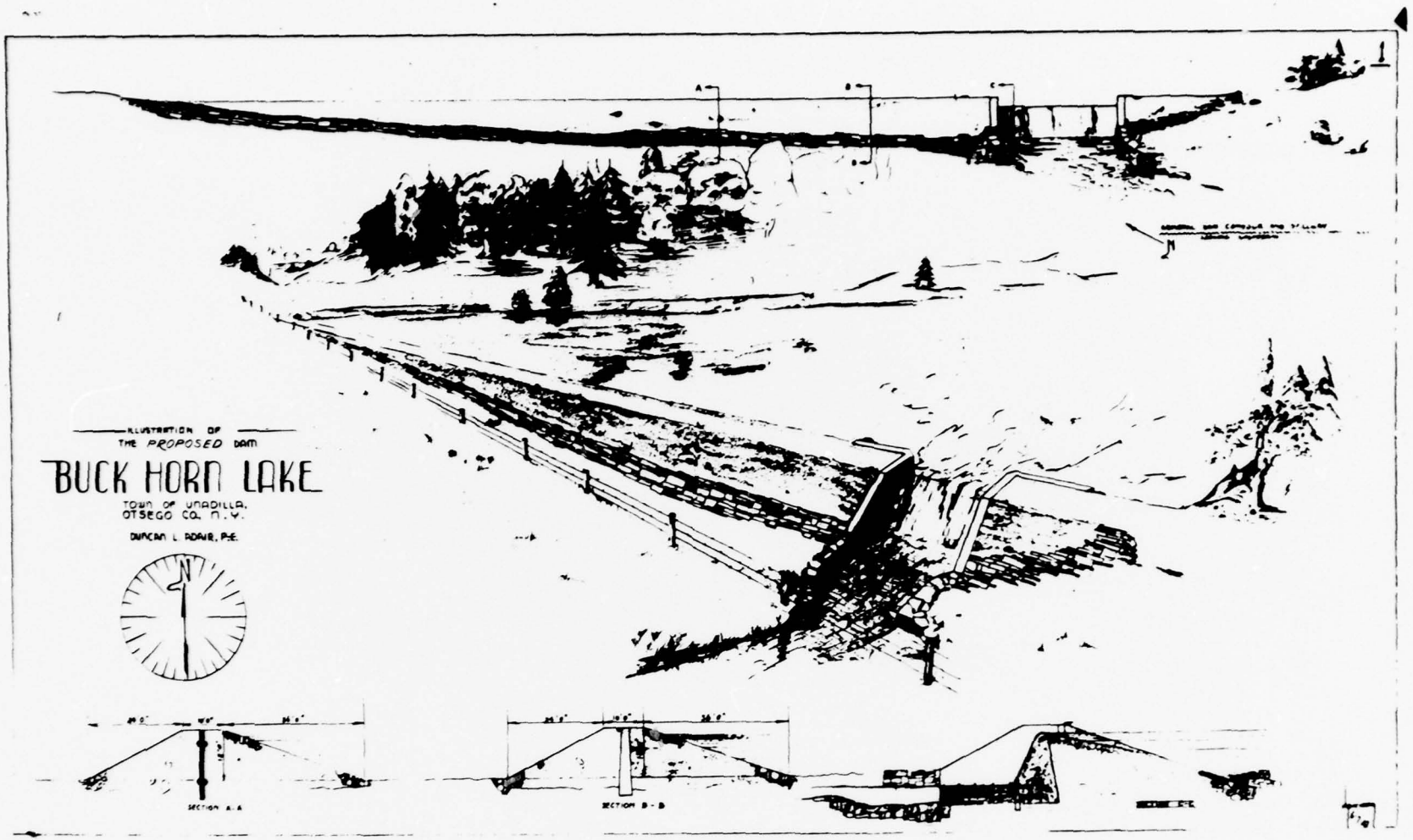


ILLUSTRATION OF
THE PROPOSED DAM
BUCK HORN LAKE
TOWN OF UNADILLA,
OTSEGO CO. N.Y.
DUNCAN L. ROWE, P.E.
N
SECTION A-A
SECTION B-B

FIGURE 2

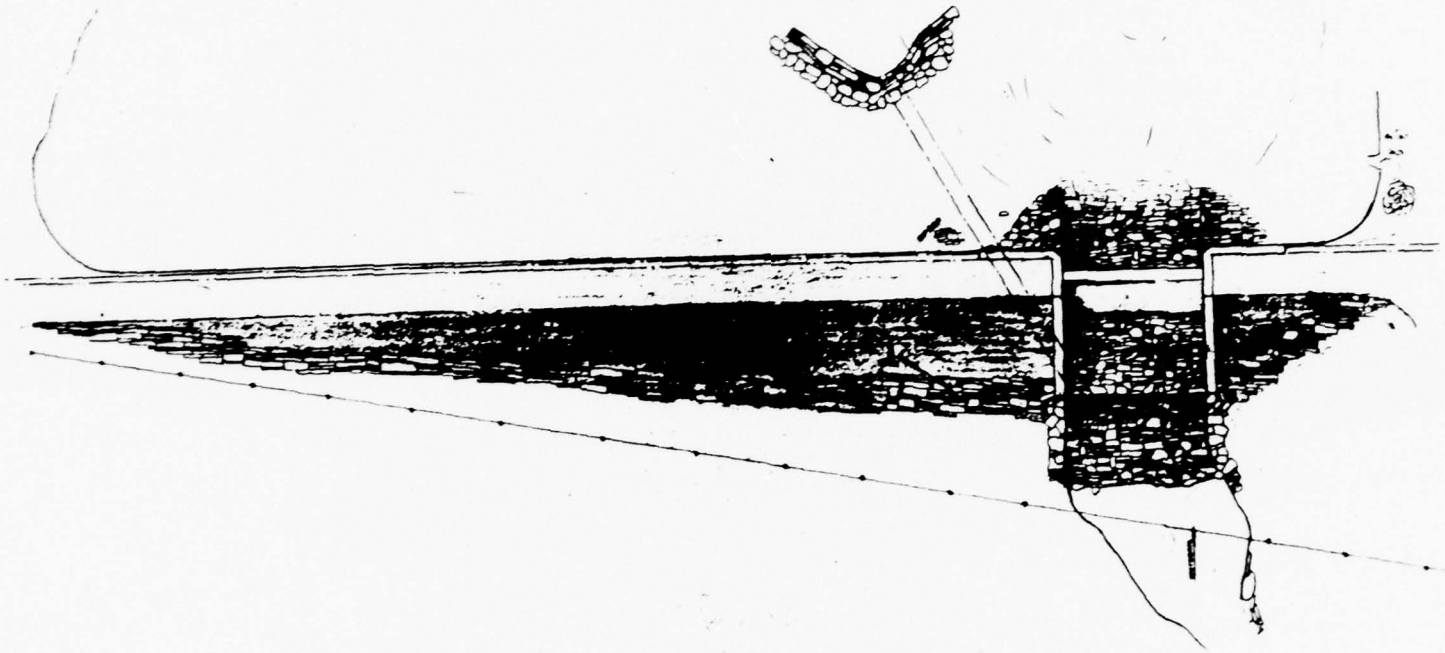


ILLUSTRATION OF
PROPOSED DAM - PLAN VIEW

BUCK HORN LAKE

TOWN OF URADELLA
OTSEGO CO. N Y

DUNCAN L ASHBURN

FIGURE 3

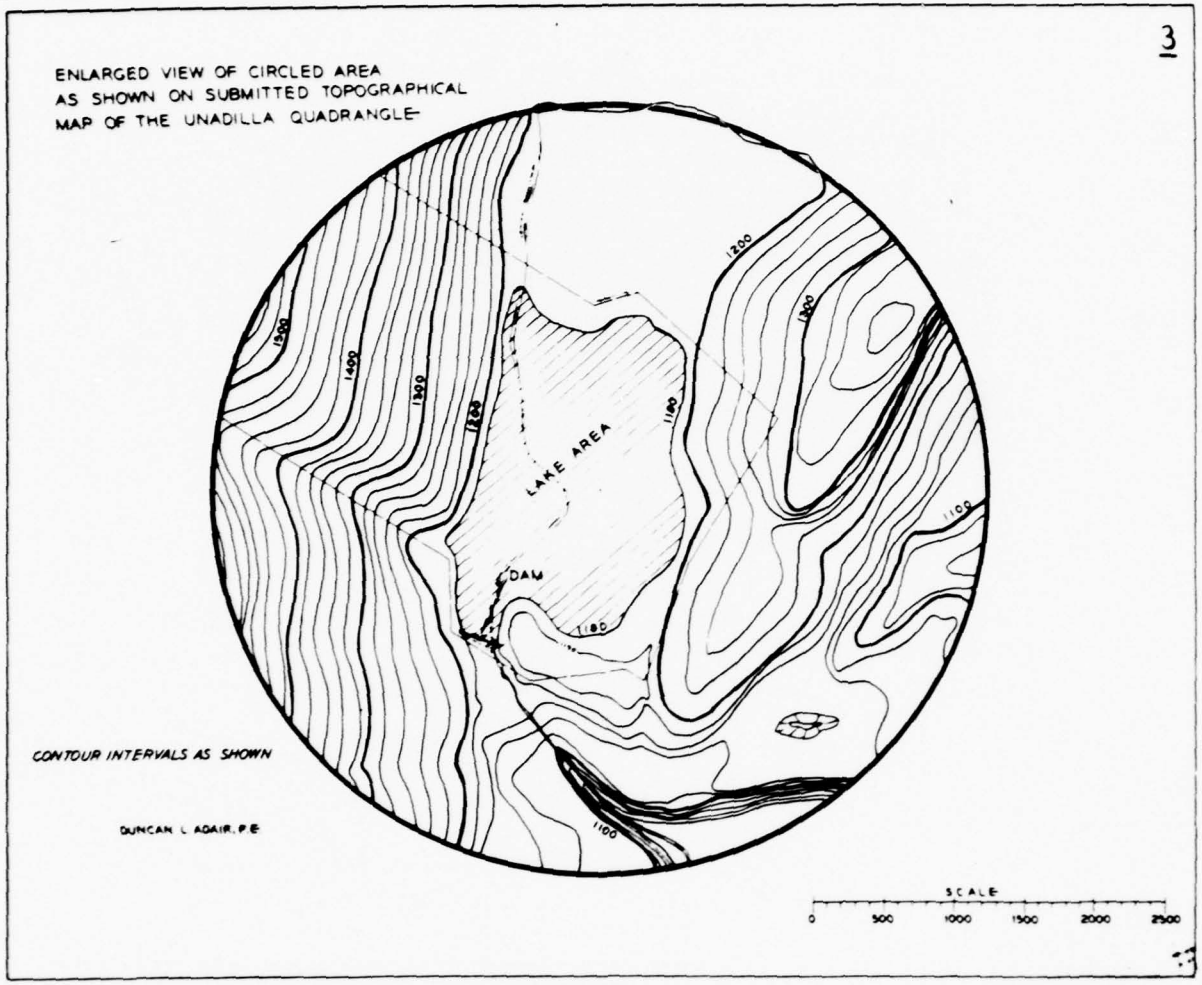

ENLARGED VIEW OF CIRCLED AREA
AS SHOWN ON SUBMITTED TOPOGRAPHICAL
MAP OF THE UNADILLA QUADRANGLE
1500
1400
1300
1200
1100
LAKE AREA
DAM
CONTOUR INTERVALS AS SHOWN
DUNCAN L AGAIR, P.E.
SCALE
0
500
1000
1500
2000
2500

FIGURE 4

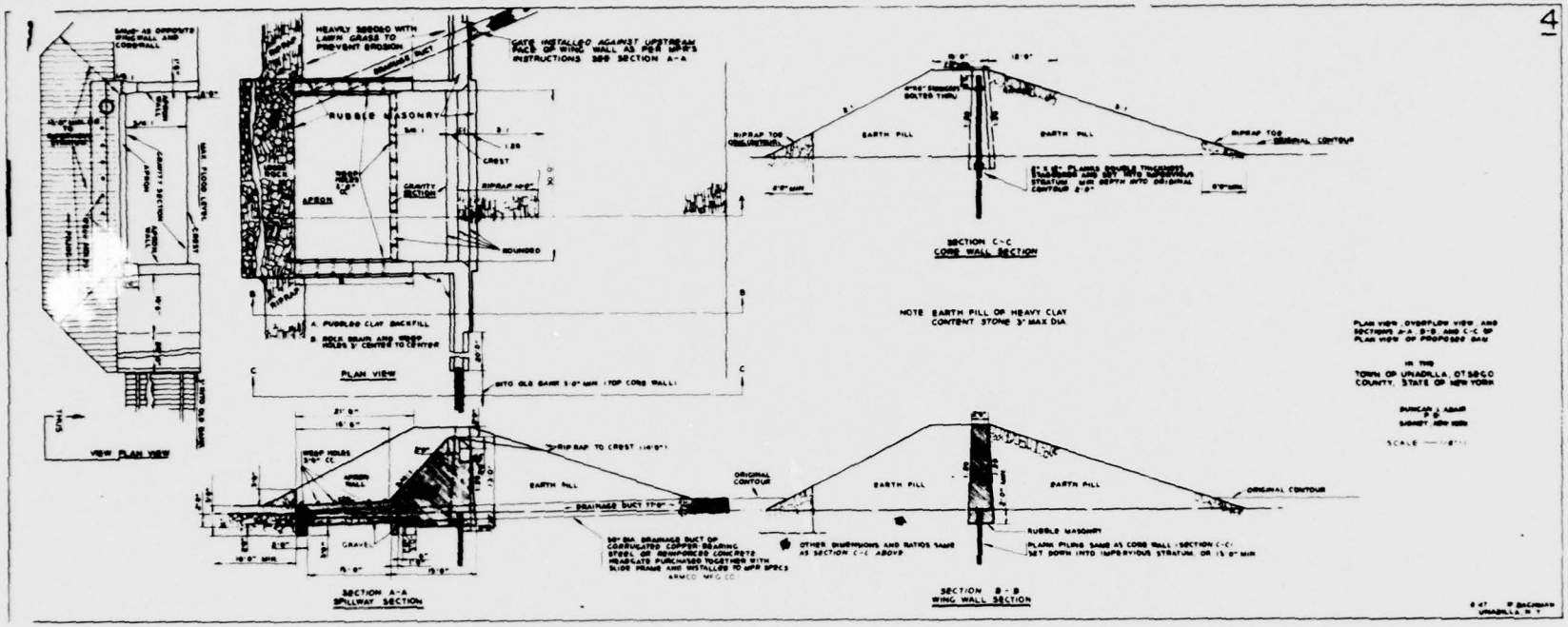

4
RUBBLE MASONRY
PLAN VIEW
SECTION A-A
SPILLWAY SECTION
SECTION C-C
CORE WALL SECTION
SECTION B-B
WING WALL SECTION
EARTH FILL
RIPRAP TO CREST
NOTE EARTH FILL OF HEAVY CLAY
CONTENT STONE 3" MAX DIA
ORIGINAL CONTOUR
DRAINAGE DUCT
GRAVEL
TOWN OF URADELLA, OTSEGO
COUNTY, STATE OF NEW YORK

FIGURE 5

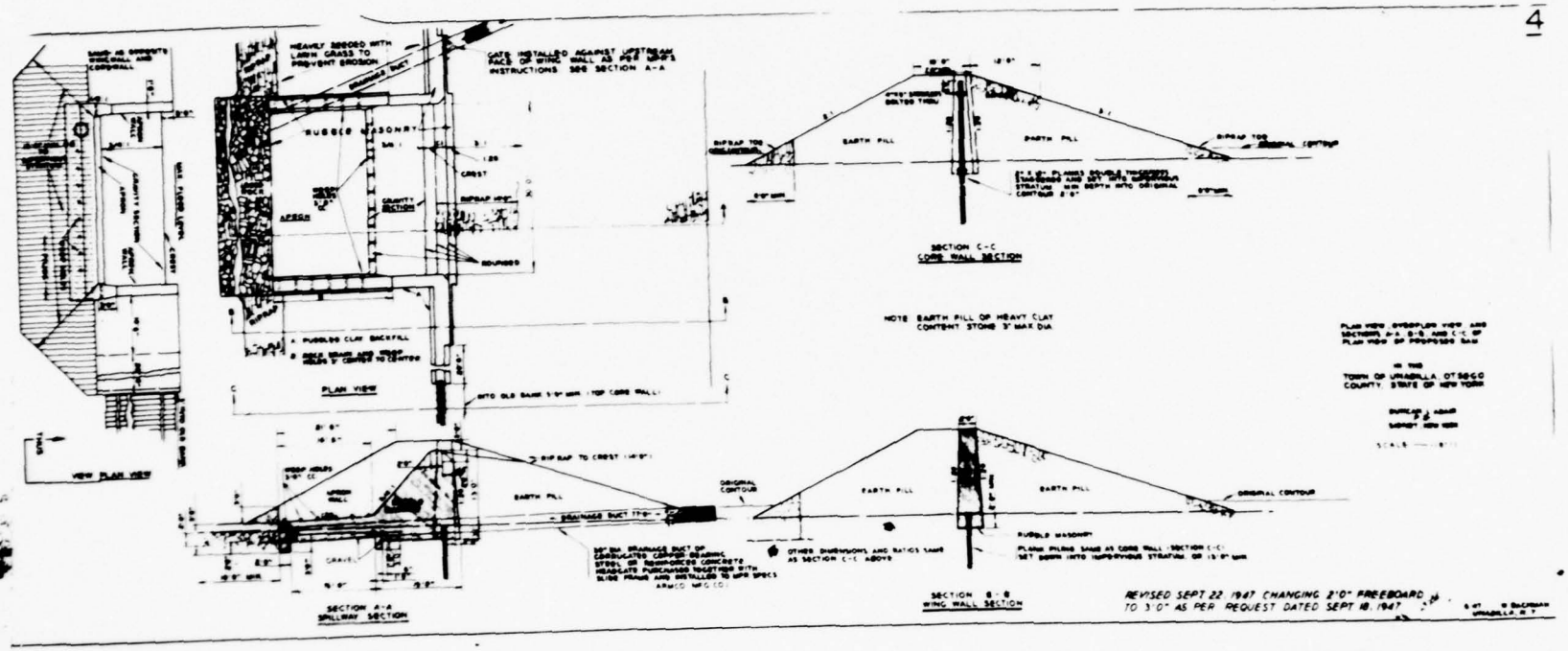

HEAVILY SODDED WITH LAWN GRASS TO PREVENT EROSION
GATE INSTALLED AGAINST UPSTREAM FACE OF WING WALL AS PER GATE INSTRUCTIONS SEE SECTION A-A
RUBBLE MASONRY
CREST
RIPRAP
GRAVITY SECTION
APRON
REMOVED
A PUDDLED CLAY BACKFILL
PLAN VIEW
INTO OLD DAM
RIPRAP TO CREST
EARTH FILL
ORIGINAL CONTOUR
DRAINAGE DUCT
SECTION A-A SPILLWAY SECTION
SECTION C-C CORE WALL SECTION
NOTE EARTH FILL OF HEAVY CLAY CONTENT STONE 3" MAX DIA
PUDDLE MASONRY
SECTION B-B WING WALL SECTION
TOWN OF URADELLA OTSEGO COUNTY STATE OF NEW YORK
REVISED SEPT 22 1947 CHANGING 2'0" FREEBOARD TO 3'0" AS PER REQUEST DATED SEPT 18 1947

FIGURE 6

APPENDIX A

FIELD INSPECTION REPORT

Probing of lake shows not deeper than 10 feet.

CHECK LIST
VISUAL INSPECTION

PHASE 1

Name Dam Buck Horn Lake County Otsego State New York ID # NY 362

Type of Dam Earthen Hazard Category _____

Date(s) Inspection Sept. 6, 1978 Weather Sunny Temperature 70

Pool Elevation at Time of Inspection (at spillway) M.S.L. * Tailwater at Time of Inspection No flow

* Plans do not indicate elevations. Believed to be around 1190 M.S.L.

Inspection Personnel:

N.F. Dunlevy	Dale Engineering	
F.W. Byszewski	Dale Engineering	
Robert Kaseguma	President of Buck Horn Lake Development	

N.F. Dunlevy Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL & HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	
STAFF GAGE OF RECORDER	N/A	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None Observed	Heavy overgrowth obstructed view.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	" "	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	" "	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	" "	
RIPRAP FAILURES	Plans show riprap on upstream side of dam. Have noticed small flat rocks (size and thickness). They do not form consistent pattern associated with a riprap face.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
Cover crop on dam	Thickly overgrown with small trees up to 4 inches in diameter with brush makes dam difficult to inspect.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Near east abutment a number of trees (pine 10" in diameter) Embankment very shallow in east abutment.	A number of large trees in area seemed to have been fallen by beaver. There are a number of beaver cuttings. No animal holes are noticed, however brush is quite heavy.
ANY NOTICEABLE SEEPAGE	Some wetness noted at east bank below dam next to spillway. Wetness not suspected from seepage. The thick shaded area has poor drainage.	Wet habitat grasses are in the area. Local drainage seems to be the problem.
STAFF GAGE AND RECORDER	None	
DRAINS	None observed. Drains were observed along the spillway sidewalls.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Spillway covered with algae. A small amount of flow was observed over the top. The face is somewhat eroded. A small crack exists.	West wing wall had been out of alignment and replaced in last ten years.
APPROACH CHANNEL	Lake front, no approach channel exists.	
DISCHARGE CHANNEL	Some debris. Buck Lake Corp. volunteer work groups routinely (yearly) clear channel. Some work had recently taken place.	Admittedly the clean-up and maintenance effort has not been as good as in previous years.
BRIDGE AND PIERS	None	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	None	
APPROACH CHANNEL	None	
DISCHARGE CHANNEL	None	
BRIDGE AND PIERS	None	
GATES AND OPERATION EQUIPMENT	None	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None. Outlet conduit corrugated metal See Below.	
INTAKE STRUCTURE	Submerged. Not observed. Reported to have been inspected 2 years ago. Since 1949 dam drain down twice.	
OUTLET STRUCTURE Drainline	24 inch corrugated metal pipe severly deteriorated. The invert is rusted out.	Has small flow.
OUTLET CHANNEL	Lots of debris. The stream bed is filled in with field stone.	
EMERGENCY GATE	None	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Is heavily overgrown below spillway. Further downstream channel is deep channel with bottom width 30 or 40 feet, 20 feet deep.	
SLOPES	Fairly steep.	
APPROXIMATE NO. OF HOMES AND POPULATION	Flood problem exists downstream along Route 7 adjacent to the Susquehanna River.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Terrain slopes well back of water surface. Area forested.	
SEDIMENTATION	No problems noted.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM _____

ID # _____

ITEM	REMARKS
AS-BUILT DRAWINGS	None
REGIONAL VICINITY MAP	See this report.
CONSTRUCTION HISTORY	Built in 1949 by Howe, a Contractor who lived in the area near the lake.
TYPICAL SECTIONS OF DAM	See plans in this report.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	" " " " "
RAINFALL/RESERVOIR RECORDS	None

ITEM	REMARKS
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	None

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Spillway wall replaced in last 10 years.
HIGH POOL RECORDS	None. Maximum spillway flow in last 12 years observed was 8 inches above crest.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION: RECORDS	None

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	See this report.
OPERATING EQUIPMENT PLANS & DETAILS	None

CHECK LIST
HYDROLOGIC & HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1220 acres

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): At spillway

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): None

ELEVATION MAXIMUM DESIGN POOL: -----

ELEVATION TOP DAM: 3 feet above spillway

CREST:

a. Elevation 1190± 10 feet
b. Type Concrete ogee crest
c. Width Ogee (rounded)
d. Length 30 feet
e. Location Spillover Center of dam
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 24 in. corrugated metal pipe
b. Location East of spillway 10 feet thru embankment
c. Entrance Inverts See Plans (No elevations)
d. Exit Inverts " "
e. Emergency Draindown Facilities None

HYDROMETEOROLOGICAL GATES:

a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: -----

APPENDIX B

PREVIOUS INSPECTION REPORTS

AND CORRESPONDENCE

Form E-61. 3-24-47-500 (6D-671)
ORD. 7-05-36

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

ALBANY

Received August 28 1947 Dam No. 118-1284

Disposition Approved Sept 23, 1947 Watershed Susquehanna

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see third page of this application) for the approval of specifications and detailed drawings, marked 1, 2, 3, AND 4 IN THE UPPER RIGHT-HAND CORNER OF EACH DRAWING, AND SPECIFICATION SHEET herewith submitted for the { construction / ~~reconstruction~~ } of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about JULY 1, 1948 (Date)

1. The dam will be on MEAD'S CREEK flowing into SUSQUEHANNA RIVER in the town of UNADILLA County of OTSEGO and 4,000 FT. N.E. OF THE UNADILLA VILLAGE LINE ALONG ROUTE 7 TO THE MOUTH OF MEAD'S CREEK, THENCE (TRUE) N. 24°15' W. APPROX. 3,325 FT.
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)
2. Location of dam is shown on the UNADILLA quadrangle of the United States Geological Survey.
3. The name of the owner is WENDELL W. BACHMAN
4. The address of the owner is 10 CHURCH ST. EXT., UNADILLA, N.Y.
5. The dam will be used for RECREATIONAL PURPOSES
6. Will any part of the dam be built upon or its pond flood any State lands? NO
7. The watershed above the proposed dam is 1.538 square miles.
8. The proposed dam will create a pond area at the spillcrest elevation of 70 acres and will impound 24,393,600 cubic feet of water.

9. The maximum height of the proposed dam above the bed of the stream is 15 feet 0 inches.

10. The lowest part of the natural shore of the pond is 2'0" AT DAM feet vertically above the spillcrest, and everywhere else the shore will be at least 4'0" feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam ROUTE 7 AND D&H R.R. UNDERPASSED WITH 5 DUCTS. NEAREST BLDG (HOME) N.E. OF HIGHWAY DUCT 250' AND BARN 310' MEASUREMENTS APPROX. AT INCREASED ELEVATIONS, BLDG'S APPROX. 790', 1250, THEN BEYOND. R.R. DUCT 14' ABOVE CREEK BED.

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) hardpan

13. Facing downstream, what is the nature of material composing the right bank? The material here under the 10" topsoil (to be reroved) is hardpan.

14. Facing downstream, what is the nature of the material composing the left bank? Material here under the 12" topsoil (to be removed) is hardpan.

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing effect of exposure to air and to water, uniformity, etc. Uniformly peculiar to imperviousness to water. Rain water is not taken into the soil where topsoil is removed, suchas cowpaths, wheeltracks, etc. It must evap.

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? N one known. Test holes did not reveal sand, gravel, or loose rock.

17. WASTES. The spillway of the above proposed dam will be 30'0" feet long in the clear; the waters will be held at the right end by aN APRON WALL the top of which will be 2'0" feet above the spillcrest, and have a top width of 10'0" feet; and at the left end by aN APRON WALL the top of which will be 2'0" feet above the spillcrest, and have a top width of 10'0" feet.

18. The spillway is designed to safely discharge 580.80 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:

ONE 30" SLUICE GATE, AND COATED CORRUGATED STEEL CONDUIT INSTALLATION. SLUICE GATE CONTROLS ATTACHED TO UPPER SIDE OF NORTHERLY WING-WALL.

20. What is the maximum height of flash boards which will used on this dam? NONE

21. APRON. Below the proposed dam there will be an apron built of RUBBLE MASONRY, 29'0" feet long across the stream, 16'6" feet wide and 2'6" TO 3'0" feet thick.

22. Does this dam constitute any part of a public water supply? NO

INSTRUCTIONS

Read carefully on the third page of this application the law setting forth the requirements to be complied with in order to construct or reconstruct a dam.

Each application for the construction or reconstruction of a dam must be made on this standard form, copies of which will be furnished upon request to the Department of Public Works, Albany, N. Y. The application must be accompanied by three sets of plans, and specifications. The information furnished must be in sufficient detail in order that the stability and safety of the dam can be determined. In cases of large and important dams assumptions made in calculating stresses and stability should be given.

Samples of materials to be used in the dam and of the material on which the dam is to be founded may be asked for, but need not be furnished unless requested.

If the dam constitutes a part of a public water supply, application should be made to the Water Power and Control Commission under Article XI of the Conservation Law.

An application for the construction or reconstruction of a dam must be signed by the prospective owner of the dam or his duly authorized agent. The address of the signer and the date must be given as provided for on the last page of the application form.

SECTION 948 OF THE CONSERVATION LAW

§ 948. Structures for impounding water; inspection of docks; penalties. No structure for impounding water and no dock, pier, wharf or other structure used as a landing place on waters shall be erected or reconstructed by any public authority or by any private person or corporation without notice to the superintendent of public works, nor shall any such structure be erected, reconstructed or maintained without complying with such conditions as the superintendent of public works may by order prescribe for safeguarding life or property against danger therefrom. No order made by the superintendent of public works shall be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of such order. The superintendent of public works shall have power, whenever in his judgment public safety shall so require, to make and serve an order, setting forth therein his findings of fact and his conclusions therefrom, directing any person, corporation, officer or board, constructing, maintaining or using any structure hereinbefore referred to, either remove the said structure or to repair or reconstruct the same within such reasonable time and in such manner as shall be specified in such order, and it shall be the duty of every such person, corporation, officer or board, to obey, observe and comply with such order and with the conditions prescribed by the superintendent of public works for safeguarding life or property against danger therefrom, and every person, corporation, officer or board failing, omitting or neglecting so to do, or who hereafter erects or reconstucts any such stucture hereinbefore referred to without submitting to the superintendent of public works and obtaining his approval of plans and specifications for such structures when required so to do by his order or hereafter fails to remove, erect or to reconstruct the same in accordance with the plans and specifications so approved shall forfeit to the people of this State a sum not to exceed five hundred dollars to be fixed by the court for each and every offense; every violation of any such order shall be a separate and distinct offense, and, in such case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense. Such order shall not contain any provision to compel the owner to make repairs or proceed with reconstruction as specified in this section by any type of construction other than that of the dam itself. In addition to said forfeiture upon the violation of any such order, the superintendent of public works shall have power to enter upon the lands and waters where such structures are located, for the purpose of removing, repairing or reconstructing the same, and to take such other and further precautions which he may deem necessary to safeguard life or property against danger therefrom. In removing, repairing and reconstructing such dam the superintendent shall not deviate from the method, manner or specifications contained in the original order. The superintendent of public works shall certify the amount of the costs and expenses incurred by him for the removal, repair or reconstruction aforesaid, or in anywise connected therewith, to the board of supervisors of the county or counties in which the said lands and waters are located, whereupon it shall be the duty of such board of supervisors to add the amount so certified to the assessment rolls of such locality or localities as a charge against the real property upon which the dam is located designated or described by the superintendent of public works as chargeable therewith, and to issue its warrant or warrants for the collection thereof. Thereupon it shall become the duty of such locality or localities through their proper officers to collect the amount so certified in the same manner as other taxes are collected in such locality or localities, and when collected to pay the same

ae superintendent of public works who shall thereupon pay the same into the state treasury. Any amount o levied shall thereupon become and be a lien upon the real property affected thereby, to the same extent as any tax levy becomes and is a lien thereon.

Any person in interest may, within thirty days from the service of any such order, appeal to the supreme court to determine the reasonableness of such order. At any time during such appeal to the supreme court upon at least three days' notice, the party appealing may apply for an order directing any question of fact to be tried and determined by a jury, and the court shall thereupon cause such question to be stated for trial accordingly and the findings of the jury upon such question shall be conclusive. Appeals may be taken from the supreme court to the appellate division of the supreme court and to the court of appeals in such cases, subject to the limitations provided in the civil practice act.

This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order heretofore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and ninety-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works, of plans and specifications theretofore approved by such commission or comissioner under this section.

The foregoing information is correct to the best of my knowledge and belief, and the construction will be carried out in accordance with the approved plans and specifications.

Wendell L. Bachman, Owner

By Duncan L. Polair, authorized agent of owner.

Address of signer 10 CHURCH ST EXT., UNADILLA, N.Y. Date Aug 25, 1947

APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.14.78

SUBJECT BUCKHORN LAKE DAM PROJECT NO. 2210

DRAWN BY JPG

ESTIMATE OF CLARK'S PARAMETERS

ESTIMATE of T_c

$$T_c = 11.9\,(L^3/H)^{.385} = (11.9\,(2.462^3)/410)^{.385} = .725 \text{ HRS}$$

SCS

$$L = \frac{l^{.8}\,(S+1)^{.7}}{1900\,Y^{.5}} = \frac{(13000)^{.8}\,(3.89+1)^{.7}}{1900\,(30)^{.5}} \qquad S = \frac{1000}{CN} - 10 = 3.89$$

$$= \frac{5938.46}{10406.73} = .571$$

$$T_c = L/.6 = .951 \text{ HRS}$$

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501
TEL 315•797•5800

DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.15.78

SUBJECT BUCKHORN LAKE DAM PROJECT NO. 2210

DRAWN BY JPG

ESTIMATE OF SNYDER'S PARAMETERS

640 C_p =
$C_p = .625$

$t_p = C_t (L \cdot L_{CA})^{.3}$
$= 2.0 (2.462 \times 1.52)^{.3}$
$= 2.971$

$t_r = t_p / 5.5 = 2.971 / 5.5 = .540$

$t_{pr} = t_p + .25 (t_R - t_r) = 2.971 + .25 (3.0 - .540)$
$= 3.586$

(Should be 1.0 JPG)

SUMMARY OF PARAMETERS

CLARK'S

BPR $T_c = .725$
SCS (CN METHOD) $T_c = .951$

SNYDER'S

$C_p = .625$

$t_{pr} = 3.586$

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.19.78

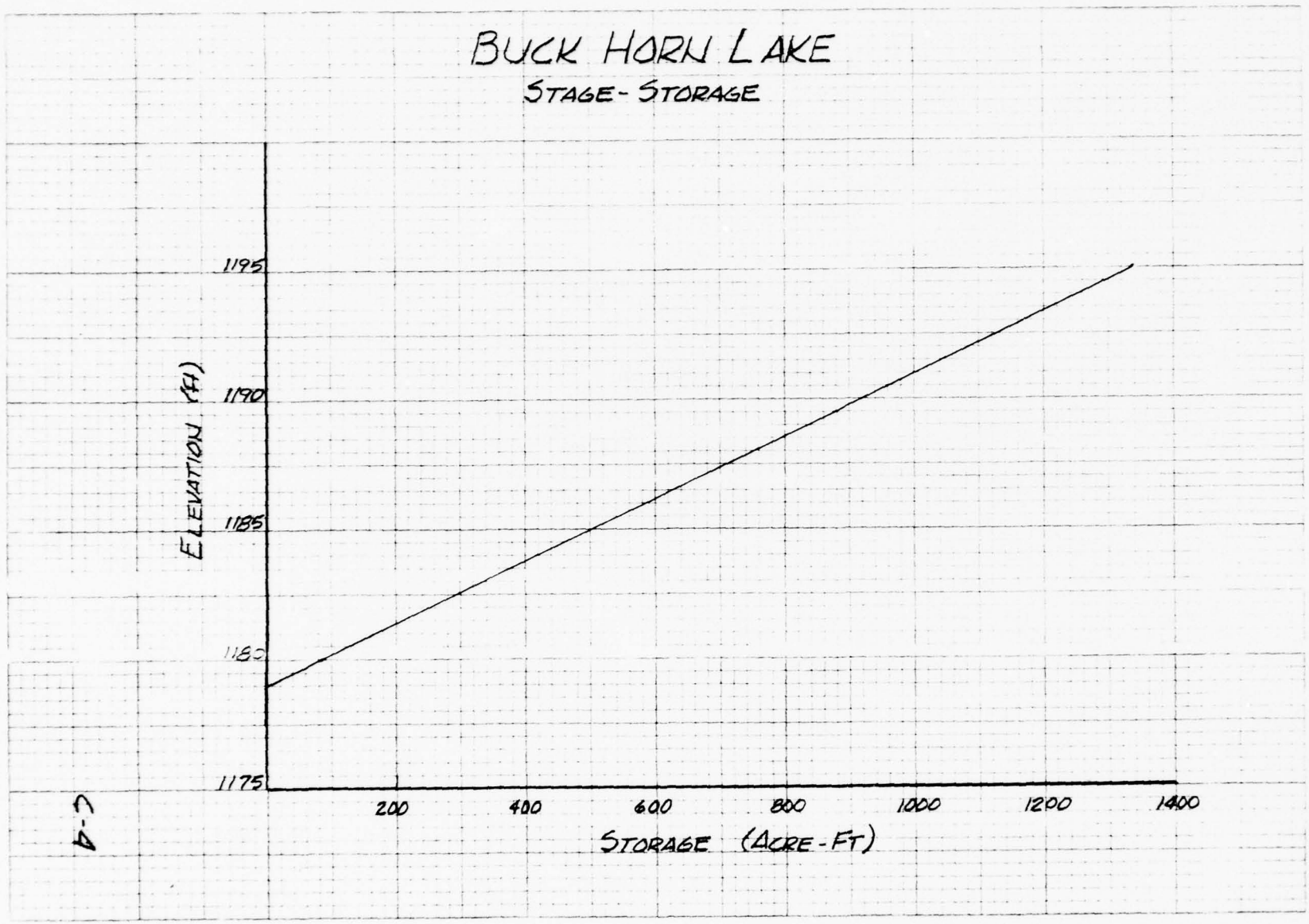
SUBJECT BUCK HORN LAKE PROJECT NO. 2210

DRAWN BY JPG

HYDROMETEOROLOGICAL REPORT Nº 33

PMP INDEX RAINFALL
24 HR, 200 MI² - 20.5"

DURATION	%	DEPTH
6 HR	111	22.76 "
12 HR	123	25.22"
24 HR	133	27.27"
48 HR	142	29.11 "


BUCK HORN LAKE
STAGE - STORAGE
ELEVATION (FT)
1195
1190
1185
1180
1175
200
400
600
800
1000
1200
1400
STORAGE (ACRE-FT)

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501
TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.15.78

SUBJECT BUCK HORN LAKE DAM PROJECT NO. 2210

DRAWN BY JPG

STAGE - DISCHARGE TABULATION (FROM SPILLWAY CREST)

ELEV		Q PRINCIPAL SPILLWAY *	Q DAM	Q TOTAL
1180		—	—	—
1181		96.00	—	96.00
1182		271.53	—	271.53
1183	(TOP OF DAM)	498.83	—	498.83
1184		768.00	362.50	1130.50
1185		1073.31	1025.30	2098.61
1186		1410.91	1883.61	3294.52
1188		2172.23	2900.00	5072.23
1189		2592.00	4052.87	6644.87
1190		3035.79	5327.64	8363.43
1191		3502.36	6713.59	10215.95
1192		3990.65	8202.44	12193.09
1193		4499.73	9787.50	14297.23
1194		5028.79	11463.26	16492.05
1195		5577.10	13225.04	18802.14

* PIPE SPILLWAY ASSUMED NOT ACTING IN THIS TABULATION


```
55  0.0   0.0    4.
56  0.0   0.0    4.
57  0.0   0.0    4.
```

STETSON·DALE

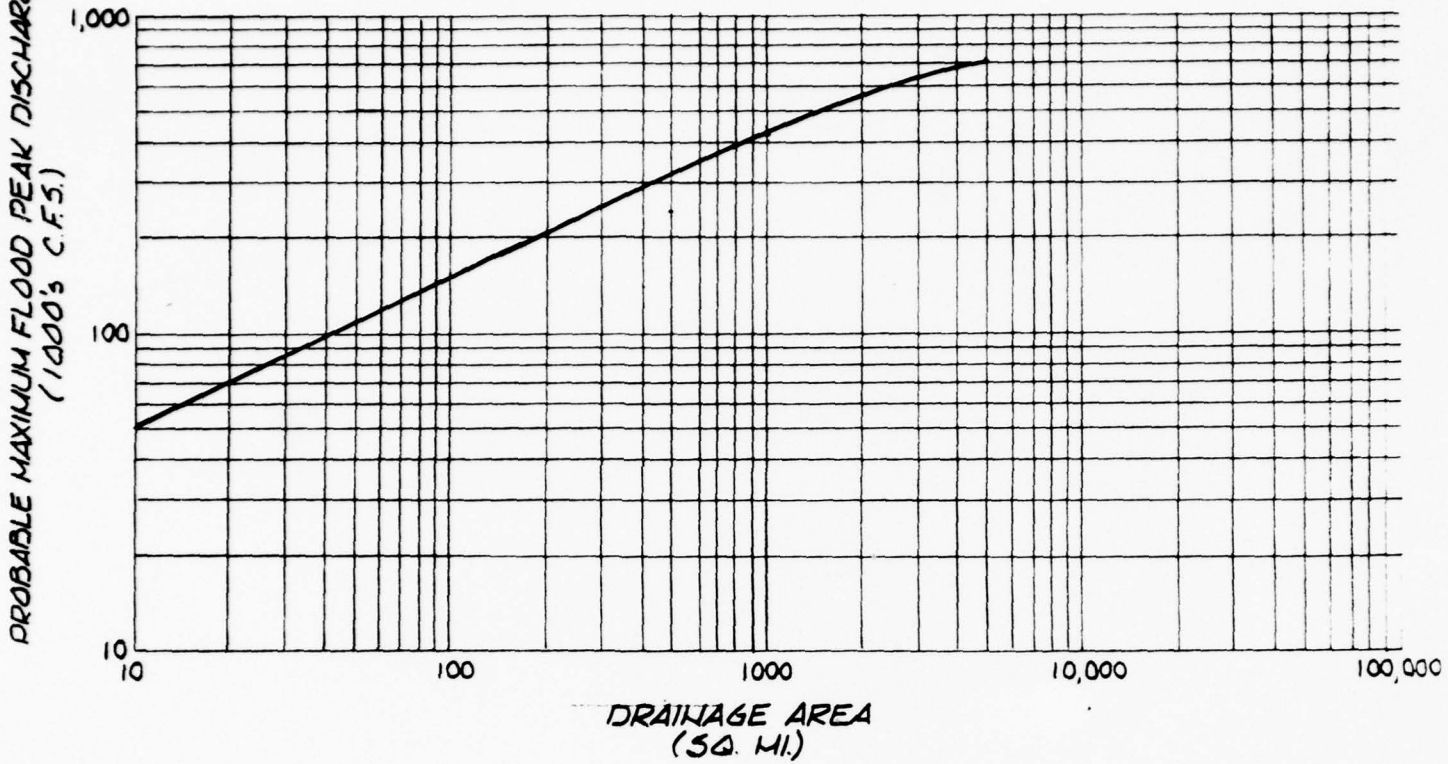
JOB 2210

DATE 9.15.78

DRAWN JDG

APP'D

C-6



BUCKHORN LAKE DAM

ESTIMATE OF PROBABLE MAXIMUM FLOOD
USING NUCLEAR REGULATORY COMMISSION CURVE

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00100 A    BUCK HORN LAKE DAM
0110 A   RESERVOIR ROUTING OF P.M.F. - SNYDER METHOD
0120 A         30 FOOT SPILLWAY
0130 B     90       1
0140 1      5
0150 J      1       9       1
0160 I     .1      .2      .3      .4      .5      .6      .7      .8     1.0
0170 K      0       1
0180 M      1       1    1.88       0    1.88                              1
0190 P      0    20.5     111     123     133     142
00200 T                                                 1.0     0.1
0210 W   3.60   0.625
0220 X      4       4       1
0230 K      1       1
0240 Y                              1       1
0250 1      1                                           -1
0260 2      0     170     340     510     680
0270 3      0     272    1130    3295    6645
0280 K     99
0290 A
0300 A
0310 A
0320 A
0330 A

00100 A    BUCK HORN LAKE DAM
0110 A   RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
0120 A         30 FOOT SPILLWAY
0130 B     90       1
0140 1      5
0150 J      1       9       1
0160 I     .1      .2      .3      .4      .5      .6      .7      .8     1.0
0170 K      0       1
0180 M      1       0    1.88       0    1.88                              1
0190 P      0    20.5     111     123     133     142
00200 T                                                 1.0     0.1
0210 V   0.95    0.95
0220 X      4       4       1
0230 K      1       1
0240 Y                              1       1
0250 1      1                                           -1
0260 2      0     170     340     510     680
0270 3      0     272    1130    3295    6645
0280 K     99
0290 A
0300 A
0310 A
0320 A
0330 A
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2.      2.      2.      2.      2.      2.      2.      2.      2.      2.
2.      2.      2.      2.      2.      2.      2.      2.      2.      2.
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EC-1 VERSION DATED JAN 1973
PDA D AUG 74
CHA E NO. 01
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BUCK HORN LAKE DAM
RESERVOIR ROUTING OF P.M.F. - SNYDER METHOD
30 FOOT SPILLWAY

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
90	1	0	0	0	0	0	0	0	0

JOPER	NWT
5	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN# 1 NRTIO# 9 LRTIO# 1

RTIOS#	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00

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SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.88	0.0	1.88	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	20.50	111.00	123.00	133.00	142.00	0.0	0.0

SPC COMPUTED BY THE PROGRAM IS 0.731

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

UNIT HYDROGRAPH DATA
TP# 3.60 CP#0.63 NTA# 0

RECESSION DATA
STRTQ# 4.00 QRCSN# 4.00 RTIOR# 1.00

PRORATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC# 4.14 AND R# 3.37 INTERVALS

UNIT HYDROGRAPH 20 END-OF-PERIOD ORDINATES, LAG# 3.63 HOURS, CP# 0.63 VOL# 1.00

26.	94.	168.	206.	184.	138.	102.	76.	56.	42.
31.	23.	17.	13.	9.	7.	5.	4.	3.	2.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	4.
2	0.01	0.00	4.
3	0.01	0.00	4.
4	0.01	0.00	4.
5	0.01	0.00	4.
6	0.01	0.00	4.
7	0.02	0.00	4.
8	0.02	0.00	4.
9	0.02	0.00	4.
10	0.02	0.00	4.
11	0.02	0.00	4.
12	0.02	0.00	4.

C-8

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

14	0.14	0.00	4.
15	0.17	0.00	4.
16	0.43	0.00	4.
17	0.16	0.06	6.
18	0.12	0.02	11.
19	0.01	0.00	17.
20	0.01	0.00	21.
21	0.01	0.00	20.
22	0.01	0.00	17.
23	0.01	0.00	14.
24	0.01	0.00	11.
25	0.10	0.00	9.
26	0.10	0.00	8.
27	0.10	0.00	7.
28	0.10	0.00	6.
29	0.10	0.00	6.
30	0.10	0.00	5.
31	0.30	0.20	10.
32	0.30	0.20	29.
33	0.30	0.20	62.
34	0.30	0.20	103.
35	0.30	0.20	140.
36	0.30	0.20	167.
37	1.66	1.56	224.
38	2.00	1.90	376.
39	2.50	2.40	661.
40	6.32	6.22	1153.
41	2.33	2.23	1818.
42	1.83	1.73	2430.
43	0.15	0.05	2735.
44	0.15	0.05	2587.
45	0.15	0.05	2148.
46	0.15	0.05	1666.
47	0.15	0.05	1254.
48	0.15	0.05	946.
49	0.0	0.0	717.
50	0.0	0.0	543.
51	0.0	0.0	409.
52	0.0	0.0	305.
53	0.0	0.0	227.
54	0.0	0.0	169.
55	0.0	0.0	126.
56	0.0	0.0	94.
57	0.0	0.0	68.
58	0.0	0.0	49.
59	0.0	0.0	34.
60	0.0	0.0	16.
61	0.0	0.0	10.
62	0.0	0.0	6.
63	0.0	0.0	5.
64	0.0	0.0	5.
65	0.0	0.0	4.
66	0.0	0.0	4.
67	0.0	0.0	4.
68	0.0	0.0	4.
69	0.0	0.0	4.
70	0.0	0.0	4.
71	0.0	0.0	4.
72	0.0	0.0	4.
73	0.0	0.0	4.
74	0.0	0.0	4.
75	0.0	0.0	4.
76	0.0	0.0	4.
77	0.0	0.0	4.
78	0.0	0.0	4.

622.	824.	793.	639.	460.	318.	252.	224.	198.	174.
153.	134.	118.	103.	91.	80.	70.	61.	54.	47.
42.	37.	32.	28.	25.	22.	19.	17.	15.	13.
12	11	9	8	8	7	6	5	5	4

80	0.0	0.0	4.
81	0.0	0.0	4.
82	0.0	0.0	4.
83	0.0	0.0	4.
84	0.0	0.0	4.
85	0.0	0.0	4.
86	0.0	0.0	4.
87	0.0	0.0	4.
88	0.0	0.0	4.
89	0.0	0.0	4.
90	0.0	0.0	4.
SUM	21.31	17.62	21618.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2735.	2231.	878.	299.	21619.
INCHES		11.04	17.37	17.77	17.83
AC-FT		1107.	1742.	1782.	1788.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	3.	6.	10.	14.	17.	22.	38.	66.	115.
182.	243.	274.	259.	215.	167.	125.	95.	72.	54.
41.	31.	23.	17.	13.	9.	7.	5.	3.	2.
1.	1.	1.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	274.	223.	88.	30.	2162.
INCHES		1.10	1.74	1.78	1.78
AC-FT		111.	174.	178.	179.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	3.	4.
4.	3.	3.	2.	2.	2.	1.	1.	1.	1.
2.	6.	12.	21.	28.	33.	45.	75.	132.	231.
364.	486.	547.	517.	430.	333.	251.	189.	143.	109.
82.	61.	45.	34.	25.	19.	14.	10.	7.	3.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	547.	446.	176.	60.	4324.
INCHES		2.21	3.47	3.55	3.57
AC-FT		221.	348.	356.	358.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	3.	5.	6.
6.	5.	4.	3.	3.	2.	2.	2.	2.	2.
3.	9.	19.	31.	42.	50.	67.	113.	198.	346.
545.	729.	821.	776.	645.	500.	376.	284.	215.	163.
123.	92.	68.	51.	38.	28.	21.	15.	10.	5.
3.	2.	2.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	821.	669.	263.	90.	6486.
INCHES		3.31	5.21	5.33	5.35

112.	98.	86.	76.	66.	58.	51.	45.	40.	35.
31.	27.	24.	21.	19.	16.	15.	13.	11.	10.
9.	8.	7.	7.	6.	5.	5.	4.	4.	4.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	4.	7.	8.
8.	7.	5.	4.	4.	3.	3.	2.	2.	2.
4.	11.	25.	41.	56.	67.	89.	150.	264.	461.
727.	972.	1094.	1035.	859.	666.	502.	378.	287.	217.
164.	122.	91.	68.	50.	38.	27.	20.	13.	7.
4.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1094.	892.	351.	120.	8647.
INCHES		4.42	6.95	7.11	7.13
AC-FT		443.	697.	713.	715.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	3.	5.	8.	10.
10.	8.	7.	6.	5.	4.	3.	3.	3.	3.
5.	14.	31.	52.	70.	84.	112.	188.	330.	577.
989.	1215.	1368.	1293.	1074.	833.	627.	473.	358.	271.
204.	153.	114.	85.	63.	47.	34.	24.	17.	8.
5.	3.	3.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1368.	1115.	439.	150.	10809.
INCHES		5.52	8.69	8.88	8.91
AC-FT		553.	871.	891.	894.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	4.	7.	10.	12.
12.	10.	8.	7.	6.	5.	4.	4.	3.	3.
6.	17.	37.	62.	84.	100.	134.	225.	397.	692.
1091.	1458.	1641.	1552.	1289.	1000.	752.	568.	430.	326.
245.	183.	136.	101.	76.	57.	41.	29.	20.	10.
6.	3.	3.	3.	3.	3.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1641.	1338.	527.	180.	12971.
INCHES		6.62	10.42	10.66	10.70
AC-FT		664.	1045.	1069.	1073.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	4.	8.	12.	15.
14.	12.	9.	8.	6.	6.	5.	4.	4.	4.
7.	20.	43.	72.	98.	117.	157.	263.	463.	807.
1273.	1701.	1915.	1811.	1504.	1166.	878.	662.	502.	380.
286.	214.	159.	118.	88.	66.	48.	34.	23.	11.
7.	4.	4.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1915.	1562.	614.	209.	15133.
INCHES		7.73	12.16	12.44	12.48
AC-FT		775.	1219.	1247.	1251.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

3.	3.	3.	3.	3.	3.	5.	8.	11.	11.
11.	10.	9.	8.	8.	7.	7.	6.	6.	6.
9.	22.	41.	59.	76.	91.	132.	241.	658.	1568.
2424.	2144.	2222.	1264.	896.	625.	422.	282.	254.	208.

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	5.	9.	14.	17.
16.	13.	11.	9.	7.	6.	6.	5.	4.	4.
8.	23.	50.	82.	112.	134.	179.	301.	529.	923.
1455.	1944.	2188.	2070.	1719.	1333.	1003.	757.	573.	434.
327.	244.	182.	135.	101.	75.	55.	39.	27.	13.
8.	4.	4.	4.	4.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2188.	1785.	702.	239.	17295.
INCHES		8.83	13.90	14.22	14.26
AC-FT		885.	1394.	1425.	1430.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	6.	11.	17.	21.
28.	17.	14.	11.	9.	8.	7.	6.	6.	5.
10.	29.	62.	103.	148.	167.	224.	376.	661.	1153.
1818.	2430.	2735.	2587.	2148.	1666.	1254.	946.	717.	543.
409.	305.	227.	169.	126.	94.	68.	49.	34.	16.
10.	6.	5.	5.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2735.	2231.	878.	299.	21618.
INCHES		11.04	17.37	17.77	17.83
AC-FT		1107.	1742.	1782.	1788.

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HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

TORAGE#	0.	170.	340.	510.	680.	0.	0.	0.	0.	0.
TFLOW#	0.	272.	1130.	3295.	6645.	0.	0.	0.	0.	0.

STATION 1, PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	4.	5.	7.	10.	15.	24.
40.	61.	86.	108.	124.	132.	134.	131.	125.	117.
109.	100.	91.	82.	73.	66.	59.	52.	46.	41.
36.	31.	28.	24.	21.	19.	16.	14.	13.	11.
10.	9.	8.	7.	6.	5.	5.	4.	4.	3.
3.	3.	2.	2.	2.	2.	2.	1.	1.	1.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	2.	3.	4.	6.	9.	15.
25.	38.	53.	67.	77.	83.	84.	82.	78.	73.

C-12

22.	20.	17.	15.	13.	12.	10.	9.	8.	7.
6.	5.	5.	4.	4.	3.	3.	3.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	134.	127.	79.	30.	2156.
INCHES		0.63	1.56	1.77	1.78
AC-FT		63.	157.	178.	178.

STATION 1, PLAN 1, RTIO 2

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	3.	5.	7.	10.	14.	19.	30.	49.
79.	122.	171.	216.	248.	264.	268.	262.	250.	235.
217.	199.	181.	164.	147.	131.	117.	104.	92.	81.
72.	63.	55.	49.	43.	37.	33.	29.	25.	22.
20.	17.	15.	14.	12.	11.	9.	8.	7.	7.
6.	5.	5.	4.	4.	3.	3.	3.	3.	2.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	3.	4.	6.	8.	12.	19.	30.
50.	76.	107.	135.	155.	165.	167.	164.	156.	147.
136.	125.	113.	102.	92.	82.	73.	65.	58.	51.
45.	39.	35.	30.	27.	23.	21.	18.	16.	14.
12.	11.	10.	8.	7.	7.	6.	5.	5.	4.
4.	3.	3.	3.	2.	2.	2.	2.	2.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	268.	254.	158.	60.	4313.
INCHES		1.26	3.12	3.54	3.56
AC-FT		126.	313.	355.	357.

STATION 1, PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	2.	2.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	4.	7.	11.	15.	20.	29.	45.	73.
119.	183.	257.	416.	518.	537.	503.	443.	376.	312.
265.	246.	225.	205.	185.	166.	148.	132.	117.	104.
91.	80.	70.	62.	54.	48.	42.	37.	33.	29.
25.	22.	20.	17.	15.	14.	12.	11.	10.	9.
8.	7.	6.	5.	5.	4.	4.	4.	3.	3.

STOR

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	3.	4.	7.	9.	13.	18.	28.	46.
74.	115.	160.	199.	219.	222.	216.	204.	191.	178.
166.	154.	141.	128.	115.	104.	93.	83.	73.	65.
57.	50.	44.	39.	34.	30.	26.	23.	20.	18.
16.	14.	12.	11.	10.	9.	8.	7.	6.	5.
5.	4.	4.	3.	3.	3.	3.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	537.	465.	240.	90.	6472.
INCHES		2.30	4.76	5.32	5.34
AC-FT		231.	477.	533.	535.

STATION 1, PLAN 1, RTIO 4

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
3.	4.	6.	9.	14.	20.	27.	39.	60.	97.
159.	245.	468.	674.	768.	766.	703.	612.	516.	425.
344.	274.	252.	231.	209.	189.	169.	151.	135.	119.
105.	92.	81.	71.	63.	55.	49.	43.	38.	33.
29.	26.	23.	20.	18.	16.	14.	13.	11.	10.
9.	8.	7.	7.	6.	5.	5.	5.	4.	4.

STOR

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	2.
2.	3.	3.	3.	3.	3.	3.	2.	2.	2.
2.	2.	4.	6.	9.	12.	17.	24.	37.	61.
99.	153.	209.	250.	268.	268.	255.	237.	218.	200.
184.	170.	158.	144.	131.	118.	106.	95.	84.	74.
66.	58.	51.	45.	39.	34.	30.	27.	24.	21.
18.	16.	14.	13.	11.	10.	9.	8.	7.	6.
6.	5.	5.	4.	4.	3.	3.	3.	3.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	768.	673.	324.	119.	8632.
INCHES		3.33	6.42	7.09	7.12
AC-FT		334.	644.	711.	714.

STATION 1, PLAN 1, RTIO 5

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	3.	4.
5.	5.	5.	6.	5.	5.	5.	5.	5.	4.
4.	5.	7.	11.	18.	25.	34.	48.	74.	121.
199.	366.	685.	908.	1003.	986.	898.	778.	653.	536.
433.	345.	272.	251.	229.	207.	186.	167.	149.	132.
116.	102.	90.	79.	70.	61.	54.	47.	42.	37.
33.	29.	25.	23.	20.	18.	16.	14.	13.	11.
10.	9.	8.	7.	7.	6.	6.	5.	5.	4.

STOR

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	2.	2.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	4.	7.	11.	16.	21.	30.	47.	76.
124.	189.	252.	296.	315.	311.	294.	270.	245.	222.
202.	185.	170.	157.	143.	129.	117.	104.	93.	82.
73.	64.	56.	49.	44.	38.	34.	30.	26.	23.
20.	18.	16.	14.	12.	11.	10.	9.	8.	7.
6.	6.	5.	5.	4.	4.	4.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1003.	876.	409.	149.	10792.
INCHES		4.34	8.09	8.87	8.90
AC-FT		435.	811.	889.	892.

STATION 1, PLAN 1, RTIO 6

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	3.	3.	4.
5.	6.	7.	7.	7.	6.	6.	6.	6.	5.
5.	6.	9.	14.	21.	30.	41.	58.	89.	146.
238.	536.	886.	1132.	1331.	1202.	1054.	918.	773.	637.
516.	412.	325.	265.	243.	221.	200.	180.	160.	142.
126.	111.	97.	86.	75.	66.	58.	51.	45.	40.
35.	31.	28.	25.	22.	19.	17.	15.	14.	12.
11.	10.	9.	8.	8.	7.	6.	6.	5.	5.

STOR

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	2.	2.	2.	2.	3.

3.	4.	5.	9.	13.	19.	25.	36.	56.	91.
149.	222.	292.	340.	356.	346.	325.	298.	269.	242.
218.	198.	180.	166.	152.	138.	125.	112.	100.	89.
79.	69.	61.	54.	47.	41.	36.	32.	28.	25.
22.	20.	17.	15.	14.	12.	11.	10.	9.	8.
7.	6.	6.	5.	5.	4.	4.	4.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1331.	1087.	494.	179.	12952.
INCHES		5.38	9.77	10.65	10.68
AC-FT		539.	980.	1067.	1071.

STATION 1, PLAN 1, RTIO 7

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	4.	5.
6.	7.	8.	8.	8.	7.	7.	7.	6.	6.
6.	7.	10.	16.	25.	35.	47.	68.	104.	170.
289.	702.	1084.	1575.	1632.	1427.	1148.	1008.	861.	716.
584.	469.	371.	291.	256.	233.	212.	190.	170.	151.
134.	118.	104.	91.	80.	71.	62.	55.	48.	43.
38.	33.	30.	26.	23.	21.	19.	17.	15.	13.
12.	11.	10.	9.	8.	8.	7.	6.	6.	6.

STOR

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	3.	3.
4.	4.	5.	5.	5.	5.	4.	4.	4.	4.
4.	4.	6.	10.	15.	22.	30.	42.	65.	106.
173.	255.	331.	375.	379.	363.	341.	316.	287.	258.
232.	209.	190.	174.	160.	146.	132.	119.	106.	95.
84.	74.	65.	57.	50.	44.	39.	34.	30.	27.
24.	21.	19.	16.	15.	13.	12.	10.	9.	8.
8.	7.	6.	6.	5.	5.	4.	4.	4.	4.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1632.	1312.	579.	209.	15113.
INCHES		6.49	11.46	12.42	12.46
AC-FT		651.	1149.	1245.	1250.

STATION 1, PLAN 1, RTIO 8

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	4.	5.	6.
7.	8.	9.	9.	9.	9.	8.	8.	7.	7.
7.	8.	12.	18.	28.	40.	54.	77.	119.	194.
399.	848.	1406.	1905.	1897.	1641.	1315.	1072.	932.	784.
645.	521.	415.	326.	266.	244.	222.	200.	179.	159.
141.	124.	109.	96.	85.	75.	66.	58.	51.	45.
40.	36.	31.	28.	25.	22.	20.	18.	16.	14.
13.	12.	11.	10.	9.	8.	8.	7.	7.	6.

STOR

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	3.	4.
5.	5.	5.	6.	5.	5.	5.	5.	5.	4.
4.	5.	7.	11.	18.	25.	34.	48.	74.	121.
195.	284.	362.	401.	400.	380.	355.	329.	301.	271.
244.	219.	198.	181.	166.	152.	138.	125.	112.	100.
88.	78.	68.	60.	53.	47.	41.	36.	32.	28.
25.	22.	20.	17.	16.	14.	12.	11.	10.	9.
8.	7.	7.	6.	6.	5.	5.	4.	4.	4.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1905.	1539.	665.	239.	17274.
INCHES		7.62	13.16	14.20	14.25
AC-FT		764.	1319.	1423.	1428.

STATION 1, PLAN 1, RTIO 9

4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	5.	6.	7.
9.	10.	11.	11.	11.	11.	10.	10.	9.	9.
9.	10.	14.	23.	35.	50.	68.	97.	149.	243.
620.	1148.	2138.	2499.	2408.	2063.	1647.	1270.	1049.	904.
756.	619.	497.	394.	309.	261.	238.	216.	194.	173.
153.	135.	119.	105.	93.	82.	72.	64.	56.	50.
44.	39.	35.	31.	28.	25.	22.	20.	18.	16.
15.	13.	12.	11.	10.	9.	9.	8.	8.	7.

STOR

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	3.	3.	4.	5.
6.	6.	7.	7.	7.	7.	6.	6.	6.	6.
5.	6.	9.	14.	22.	31.	42.	60.	93.	152.
239.	341.	419.	447.	440.	413.	381.	351.	324.	295.
266.	239.	215.	194.	177.	163.	149.	135.	121.	108.
96.	85.	75.	66.	58.	51.	45.	40.	35.	31.
28.	24.	22.	19.	17.	15.	14.	12.	11.	10.
9.	8.	8.	7.	6.	6.	6.	5.	5.	5.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2499.	2004.	837.	299.	21596.
INCHES		9.92	16.56	17.75	17.81
AC-FT		994.	1661.	1780.	1786.

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PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

			RATIOS APPLIED TO FLOWS								
PERATION	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00
HYDROGRAPH AT	1	1	274.	547.	821.	1094.	1368.	1641.	1915.	2188.	2735.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
OUTED TO	1	1	134.	268.	537.	768.	1003.	1331.	1632.	1905.	2499.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.

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HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
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BUCK HORN LAKE DAM
RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
30 FOOT SPILLWAY

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
90	1	0	0	0	0	0	0	0	0

JOPER	NWT
5	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN# 1 NRTIO# 9 LRTIO# 1

RTIOS#	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	0	1.88	0.0	1.88	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	20.50	111.00	123.00	133.00	142.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.731

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

UNIT HYDROGRAPH DATA

TC# 0.95 R# 0.95 NTA# 0

RECESSION DATA

STRTQ# 4.00 QRCSN# 4.00 RTIOR# 1.00

TC INCREASED TO TRHR OF 1.00

UNIT HYDROGRAPH 6 END-OF-PERIOD ORDINATES, LAG# 0.97 HOURS, CP# 0.53 VOL# 1.00

418. 548. 170. 53. 16. 5.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	4.
2	0.01	0.00	4.
3	0.01	0.00	4.
4	0.01	0.00	4.
5	0.01	0.00	4.
6	0.01	0.00	4.
7	0.02	0.00	4.
8	0.02	0.00	4.
9	0.02	0.00	4.
10	0.02	0.00	4.
11	0.02	0.00	4.
12	0.02	0.00	4.
13	0.11	0.00	4.
14	0.14	0.00	4.
15	0.17	0.00	4.
16	0.43	0.00	6.
17	0.16	0.06	31.
18	0.12	0.02	46.
19	0.01	0.00	27.
20	0.01	0.00	11.
21	0.01	0.00	6.
22	0.01	0.00	5.
23	0.01	0.00	4.
24	0.01	0.00	4.
25	0.10	0.00	4.
26	0.10	0.00	4.
27	0.10	0.00	4.
28	0.10	0.00	4.
29	0.10	0.00	4.
30	0.10	0.00	4.
31	0.30	0.20	88.
32	0.30	0.20	197.
33	0.30	0.20	231.
34	0.30	0.20	241.
35	0.30	0.20	245.
36	0.30	0.20	246.
37	1.66	1.56	816.
38	2.00	1.90	1702.
39	2.50	2.40	2325.
40	6.32	6.22	4327.
41	2.33	2.23	4879.
42	1.83	1.73	3172.
43	0.15	0.05	1729.
44	0.15	0.05	578.
45	0.15	0.05	220.
46	0.15	0.05	103.
47	0.15	0.05	73.
48	0.15	0.05	64.
49	0.0	0.0	43.
50	0.0	0.0	16.
51	0.0	0.0	8.
52	0.0	0.0	5.
53	0.0	0.0	4.

55	0.0	0.0	4.
56	0.0	0.0	4.
57	0.0	0.0	4.
58	0.0	0.0	4.
59	0.0	0.0	4.
60	0.0	0.0	4.
61	0.0	0.0	4.
62	0.0	0.0	4.
63	0.0	0.0	4.
64	0.0	0.0	4.
65	0.0	0.0	4.
66	0.0	0.0	4.
67	0.0	0.0	4.
68	0.0	0.0	4.
69	0.0	0.0	4.
70	0.0	0.0	4.
71	0.0	0.0	4.
72	0.0	0.0	4.
73	0.0	0.0	4.
74	0.0	0.0	4.
75	0.0	0.0	4.
76	0.0	0.0	4.
77	0.0	0.0	4.
78	0.0	0.0	4.
79	0.0	0.0	4.
80	0.0	0.0	4.
81	0.0	0.0	4.
82	0.0	0.0	4.
83	0.0	0.0	4.
84	0.0	0.0	4.
85	0.0	0.0	4.
86	0.0	0.0	4.
87	0.0	0.0	4.
88	0.0	0.0	4.
89	0.0	0.0	4.
90	0.0	0.0	4.
SUM	21.31	17.62	21684.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4879.	3022.	888.	300.	21684.
INCHES		14.95	17.58	17.82	17.88
AC-FT		1499.	1762.	1787.	1793.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	3.	5.	3.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9.	20.	23.	24.	24.	25.	82.	170.	233.	433.
488.	317.	173.	58.	22.	10.	7.	6.	4.	2.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	488.	302.	89.	30.	2168.
INCHES		1.50	1.76	1.78	1.79
AC-FT		150.	176.	179.	179.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	6.	9.	5.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	976.	604.	178.	60.	4337.
INCHES		2.99	3.52	3.56	3.58
AC-FT		300.	352.	357.	359.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	2.	9.	14.	8.	3.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
26.	59.	69.	72.	73.	74.	245.	511.	698.	1298.
1464.	952.	519.	173.	66.	31.	22.	19.	13.	5.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1464.	907.	266.	90.	6505.
INCHES		4.49	5.27	5.35	5.36
AC-FT		450.	529.	536.	538.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	12.	19.	11.	4.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
35.	79.	92.	97.	98.	98.	326.	681.	930.	1731.
1951.	1269.	692.	231.	88.	41.	29.	26.	17.	6.
3.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1951.	1209.	355.	120.	8673.
INCHES		5.98	7.03	7.13	7.15
AC-FT		600.	705.	715.	717.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	15.	23.	14.	6.
3.	2.	2.	2.	2.	2.	2.	2.	2.	2.
44.	98.	115.	121.	122.	123.	408.	851.	1163.	2163.
2439.	1586.	864.	289.	110.	51.	36.	32.	22.	8.
4.	3.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2439.	1511.	444.	150.	10842.
INCHES		7.48	8.79	8.91	8.94
AC-FT		750.	881.	894.	896.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	4.	18.	28.	16.	7.
4.	3.	2.	2.	2.	2.	2.	2.	2.	2.
53.	118.	139.	145.	147.	147.	490.	1021.	1395.	2596.
2927.	1903.	1037.	347.	132.	62.	44.	39.	26.	10.
5.	3.	3.	2.	2.	2.	2.	2.	2.	2.

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2927.	1813.	533.	180.	13010.
INCHES		8.97	10.55	10.69	10.73
AC-FT		900.	1057.	1072.	1076.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	4.	22.	32.	19.	8.
4.	3.	3.	3.	3.	3.	3.	3.	3.	3.
61.	138.	162.	169.	171.	172.	571.	1192.	1628.	3029.
3415.	2220.	1210.	405.	154.	72.	51.	45.	30.	11.
5.	4.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3415.	2116.	622.	210.	15178.
INCHES		10.47	12.30	12.48	12.52
AC-FT		1050.	1234.	1251.	1255.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	5.	25.	37.	22.	9.
5.	4.	3.	3.	3.	3.	3.	3.	3.	3.
70.	158.	185.	193.	196.	197.	653.	1362.	1860.	3461.
3903.	2537.	1383.	462.	176.	82.	58.	51.	35.	13.
6.	4.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3903.	2418.	711.	240.	17347.
INCHES		11.96	14.06	14.26	14.31
AC-FT		1200.	1410.	1430.	1434.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	6.	31.	46.	27.	11.
6.	5.	4.	4.	4.	4.	4.	4.	4.	4.
88.	197.	231.	241.	245.	246.	816.	1702.	2325.	4327.
4878.	3172.	1729.	578.	220.	103.	73.	64.	43.	16.
8.	5.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4878.	3022.	888.	300.	21684.
INCHES		14.95	17.58	17.82	17.88
AC-FT		1499.	1762.	1787.	1793.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	0

ROUTING DATA

QLOSS CLOSS AVG IRES ISAME

7	0.02	0.00	4.
8	0.02	0.00	4.
9	0.02	0.00	4.
10	0.02	0.00	4.
11	0.02	0.00	4.
12	0.02	0.00	4.

C-8

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE#	0.	170.	340.	510.	680.	0.	0.	0.	0.	0.
OUTFLOW#	0.	272.	1130.	3295.	6645.	0.	0.	0.	0.	0.

STATION 1, PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	3.	5.	7.	9.	11.	17.	30.	51.	86.
133.	166.	176.	168.	152.	136.	120.	106.	93.	82.
72.	63.	55.	49.	43.	37.	33.	29.	25.	22.
19.	17.	15.	13.	12.	10.	9.	8.	7.	6.
5.	5.	4.	4.	3.	3.	3.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
1.	2.	3.	5.	6.	7.	10.	19.	32.	54.
83.	104.	110.	105.	95.	85.	75.	66.	58.	51.
45.	40.	35.	30.	27.	23.	21.	18.	16.	14.
12.	11.	9.	8.	7.	6.	6.	5.	4.	4.
3.	3.	3.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	176.	155.	81.	30.	2165.
INCHES		0.77	1.61	1.78	1.79
AC-FT		77.	161.	178.	179.

STATION 1, PLAN 1, RTIO 2

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	1.	1.
2.	6.	10.	15.	19.	23.	33.	60.	103.	172.
265.	439.	457.	379.	276.	243.	215.	190.	168.	148.
130.	114.	100.	88.	77.	67.	59.	52.	46.	40.
35.	31.	27.	24.	21.	19.	16.	14.	13.	11.
10.	9.	8.	7.	6.	6.	5.	4.	4.	4.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	1.	1.	1.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	3.	6.	9.	12.	14.	21.	38.	64.	108.
166.	203.	207.	191.	171.	152.	134.	119.	105.	92.
81.	71.	62.	55.	48.	42.	37.	32.	28.	25.
22.	19.	17.	15.	13.	12.	10.	9.	8.	7.
6.	6.	5.	4.	4.	3.	3.	3.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	457.	343.	163.	60.	4331.
INCHES		1.70	3.23	3.56	3.57
AC-FT		170.	324.	357.	358.

STATION 1, PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	3.	4.	4.
4.	4.	3.	3.	3.	3.	3.	2.	2.	2.

C-22

74	0.0	0.0	4.
75	0.0	0.0	4.
76	0.0	0.0	4.
77	0.0	0.0	4.
78	0.0	0.0	4.

C-9

622.	824.	793.	639.	460.	318.	252.	224.	198.	174.
153.	134.	118.	103.	91.	80.	70.	61.	54.	47.
42.	37.	32.	28.	25.	22.	19.	17.	15.	13.
12.	11.	9.	8.	8.	7.	6.	5.	5.	4.
4.	4.	3.	3.	3.	3.	2.	2.	2.	2.

STOR

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	3.
3.	2.	2.	2.	2.	2.	2.	1.	1.	1.
2.	5.	10.	14.	18.	21.	31.	56.	96.	162.
239.	279.	273.	243.	207.	179.	158.	140.	124.	109.
96.	84.	74.	65.	57.	50.	44.	38.	34.	30.
26.	23.	20.	18.	16.	14.	12.	11.	10.	8.
7.	7.	6.	5.	5.	4.	4.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	824.	609.	249.	90.	6499.
INCHES		3.02	4.92	5.34	5.36
AC-FT		302.	494.	535.	537.

STATION 1, PLAN 1, RTIO 4

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	4.	5.	6.
5.	5.	5.	4.	4.	4.	3.	3.	3.	3.
5.	11.	20.	30.	38.	45.	66.	120.	205.	475.
946.	1221.	1092.	875.	628.	433.	296.	247.	219.	194.
170.	149.	131.	115.	101.	89.	78.	68.	60.	53.
46.	41.	36.	32.	28.	25.	22.	19.	17.	15.
14.	12.	11.	10.	9.	8.	7.	6.	6.	5.
5.	4.	4.	4.	3.	3.	3.	3.	3.	3.

STOR

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	3.	4.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
3.	7.	13.	18.	24.	28.	41.	75.	128.	210.
304.	347.	333.	289.	240.	202.	175.	155.	137.	121.
106.	93.	82.	72.	63.	55.	49.	43.	38.	33.
29.	26.	23.	20.	18.	15.	14.	12.	11.	10.
8.	8.	7.	6.	5.	5.	4.	4.	4.	3.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1221.	873.	335.	120.	8667.
INCHES		4.32	6.62	7.12	7.15
AC-FT		433.	664.	714.	717.

STATION 1, PLAN 1, RTIO 5

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	3.	5.	7.	7.
7.	6.	6.	5.	5.	4.	4.	4.	4.	3.
6.	14.	25.	37.	47.	57.	83.	150.	257.	715.
1394.	1821.	1410.	983.	712.	494.	339.	258.	230.	203.
179.	157.	138.	121.	106.	93.	82.	72.	63.	56.
49.	43.	38.	34.	30.	26.	23.	21.	18.	16.
15.	13.	12.	10.	9.	8.	8.	7.	6.	6.
5.	5.	5.	4.	4.	4.	4.	3.	3.	3.

STOR

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	3.	4.	4.
4.	4.	4.	3.	3.	3.	3.	2.	2.	2.
4.	9.	17.	22.	28.	35.	52.	84.	148.	250.

C-23

1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	821.	669.	263.	90.	6486.
INCHES		3.31	5.21	5.33	5.35

C-10

112. 98. 86. 76. 66. 58. 51. 45. 40. 35.
31. 27. 24. 21. 19. 16. 15. 13. 11. 10.
9. 8. 7. 7. 6. 5. 5. 4. 4. 4.
3. 3. 3. 3. 2. 2. 2. 2. 2. 2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1821.	1172.	421.	150.	10835.
INCHES		5.80	8.34	8.90	8.94
AC-FT		582.	836.	893.	896.

STATION 1, PLAN 1, RTIO 6

2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 4. 6. 8. 8.
8. 7. 7. 6. 6. 5. 5. 5. 4. 4.
7. 17. 31. 44. 57. 68. 99. 181. 372. 933.
1997. 2285. 1723. 1071. 784. 547. 376. 268. 239. 211.
186. 163. 143. 126. 111. 97. 85. 75. 66. 58.
51. 45. 40. 35. 31. 28. 24. 22. 19. 17.
15. 14. 12. 11. 10. 9. 8. 8. 7. 6.
6. 5. 5. 5. 4. 4. 4. 4. 4. 3.

STOR

1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 2. 2. 4. 5. 5.
5. 5. 4. 4. 4. 3. 3. 3. 3. 3.
4. 10. 19. 28. 36. 43. 62. 113. 190. 301.
408. 431. 387. 328. 271. 224. 191. 167. 149. 132.
116. 102. 90. 79. 69. 61. 53. 47. 41. 36.
32. 28. 25. 22. 19. 17. 15. 14. 12. 11.
10. 9. 8. 7. 6. 6. 5. 5. 4. 4.
4. 3. 3. 3. 3. 3. 2. 2. 2. 2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2285.	1465.	589.	180.	13003.
INCHES		7.25	10.07	10.69	10.72
AC-FT		727.	1009.	1071.	1075.

STATION 1, PLAN 1, RTIO 7

3. 3. 3. 3. 3. 3. 3. 3. 3. 3.
3. 3. 3. 3. 3. 3. 4. 7. 9. 10.
9. 9. 8. 7. 7. 6. 6. 5. 5. 5.
8. 20. 36. 52. 66. 80. 116. 211. 515. 1152.
2579. 2744. 2034. 1188. 845. 593. 409. 285. 246. 218.
192. 169. 148. 130. 114. 101. 88. 78. 69. 60.
53. 47. 41. 37. 32. 29. 26. 23. 20. 18.
16. 15. 13. 12. 11. 10. 9. 8. 7. 7.
6. 6. 6. 5. 5. 5. 4. 4. 4. 4.

STOR

2. 2. 2. 2. 2. 2. 2. 2. 2. 2.
2. 2. 2. 2. 2. 2. 3. 4. 6. 6.
6. 5. 5. 5. 4. 4. 4. 3. 3. 3.
5. 12. 22. 32. 42. 50. 72. 132. 218. 342.
454. 467. 411. 345. 284. 234. 197. 173. 154. 136.
120. 105. 93. 81. 71. 63. 55. 49. 43. 38.
33. 29. 26. 23. 20. 18. 16. 14. 13. 11.
10. 9. 8. 7. 7. 6. 6. 5. 5. 4.
4. 4. 3. 3. 3. 3. 3. 3. 3. 2.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2744.	1757.	596.	210.	15171.
INCHES		8.69	11.80	12.47	12.51
AC-FT		872.	1183.	1250.	1254.

C-24

STATION 1, PLAN 1, RTIO 8

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1915.	1562.	614.	209.	15133.
INCHES		7.73	12.16	12.44	12.48
AC-FT		775.	1219.	1247.	1251.

C-11

	3.	3.	3.	3.	3.	3.	5.	8.	11.	11.
	11.	10.	9.	8.	8.	7.	7.	6.	6.	6.
	9.	22.	41.	59.	76.	91.	132.	241.	658.	1568.
	3026.	3160.	2333.	1360.	886.	625.	433.	303.	251.	223.
	196.	173.	152.	133.	117.	103.	91.	80.	70.	62.
	55.	48.	43.	38.	33.	30.	26.	24.	21.	19.
	17.	15.	14.	12.	11.	10.	9.	9.	8.	7.
	7.	6.	6.	6.	5.	5.	5.	5.	4.	4.
					STOR					
	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
	2.	2.	2.	2.	2.	2.	3.	5.	7.	7.
	7.	6.	6.	5.	5.	4.	4.	4.	4.	3.
	6.	14.	25.	37.	47.	57.	83.	150.	246.	374.
	489.	499.	434.	358.	292.	240.	202.	176.	157.	139.
	123.	108.	95.	83.	73.	64.	57.	50.	44.	39.
	34.	30.	27.	24.	21.	19.	17.	15.	13.	12.
	11.	9.	9.	8.	7.	6.	6.	5.	5.	5.
	4.	4.	4.	4.	3.	3.	3.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3160.	2055.	684.	240.	17339.
INCHES		10.17	13.53	14.25	14.30
AC-FT		1020.	1357.	1429.	1434.

STATION 1, PLAN 1, RTIO 9

4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	6.	10.	13.	14.
13.	12.	11.	10.	10.	9.	8.	8.	7.	7.
12.	28.	51.	74.	95.	114.	165.	353.	926.	2377.
4098.	4033.	2770.	1655.	959.	684.	478.	337.	260.	232.
204.	180.	158.	139.	122.	108.	95.	83.	74.	65.
57.	51.	45.	40.	35.	32.	28.	25.	23.	20.
18.	16.	15.	14.	12.	11.	10.	10.	9.	8.
8.	7.	7.	7.	6.	6.	6.	5.	5.	5.
				STOR					
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	4.	6.	8.	9.
8.	8.	7.	7.	6.	6.	5.	5.	5.	4.
7.	17.	32.	46.	59.	71.	103.	186.	300.	438.
551.	547.	469.	381.	306.	252.	211.	183.	163.	145.
128.	112.	99.	87.	76.	67.	59.	52.	46.	41.
36.	32.	28.	25.	22.	20.	18.	16.	14.	13.
11.	10.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	4.	4.	4.	4.	4.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4098.	2649.	859.	300.	21676.
INCHES		13.11	17.01	17.81	17.88
AC-FT		1314.	1705.	1786.	1792.

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PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

C-25

			RATIOS APPLIED TO FLOWS								
ERA ON	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00

HYDROGRAPH AT	1	1	488.	976.	1464.	1951.	2439.	2927.	3415.	3903.	4878.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
ROUTED TO	1	1	176.	457.	824.	1221.	1821.	2285.	2744.	3160.	4098.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.

CFS	537.	465.	240.	90.	6472.
INCHES		2.30	4.76	5.32	5.34
AC-FT		231.	477.	533.	535.

STATION 1, PLAN 1, RTIO 4

2. 2. 2. 2. 2. 2. 2. 2. 2. 2.

APPENDIX D

REFERENCES

APPENDIX

REFERENCES

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